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# QUEENSLAND AGRICULTURAL JOURNAL

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PART 1

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## Event and Comment.

### Dairying in Queensland.

IT will be remembered that the Minister for Agriculture and Stock (Mr. W. Forgan Smith) announced last year the appointment of a Departmental Committee to make a survey of economic facts relating to some important phases of agriculture in Queensland. The committee has performed a large amount of useful spade-work, and from the vast quantity of material it has collected much valuable data has been extracted. The Minister decided to issue to producers a series of bulletins containing some of the conclusions based upon this data. The first Bulletin "Dairying in Queensland, No. 1 D.," containing a brief review of the present conditions of the industry, has already been distributed, and the main portion of it was published in last month's Journal. The second bulletin is now available, and the full text of it will be a leading feature of our August issue. In it three outstanding factors are elucidated and stressed: The need of herd improvement, the importance of feeding, and the necessity of herd testing. The bulletin not only sets these out as meriting the immediate attention of those engaged in dairying in this State, but also extends a standing invitation to them to take advantage of the helping hand of the Department, and of the facilities which it offers. Facts and figures are cited in support of herd improvement, and particulars of the Better Bull Scheme are also given. The importance of feeding is emphasised, and a list of dairy fodder crops recommended for use in Queensland, together with particulars of their cultivation, are set out. Herd testing, as carried out by officers of the Department, is reviewed, and many cogent and impressive facts are pithily presented. The dairymen of Queensland

are asked to avail themselves of the services which are at their disposal free of any charge. They are also invited to set before themselves the reasonable objective of raising the average annual yield per cow to 260 lb. commercial butter. The attainment of this objective obviously means a greater measure of prosperity to all concerned, and to reach it there should be no difficulty in securing the co-operation of all engaged in the industry.

### Queensland Butter Factory Successes.

THE Deputy Premier and Minister for Agriculture (Mr. W. Forgan Smith) followed with much interest the reports of the proceedings of the Queensland Butter and Cheese Factory Managers' Association Conference which was in session at Brisbane last month. Efforts to improve the standards in the dairying industry generally, and on the manufacturing side in particular, were, he informed the Press recently, worthy of commendation. Evidence of this he observed in some recent successes achieved by Queensland manufacturers in important competitions, in which the butter and cheese of other States have been exhibited.

In the first competition for the World's Butter Championship, conducted at the Auckland Winter Show in August, 1925, the Oakey District Co-operative Factory secured second place with 96 points, the first prize gaining 96½ points.

At the Royal Melbourne Show last year Queensland factories secured these awards:—Salt butter, suitable for export, won by Oakey District Co-operative Butter Association. The champion prize for cheese of any age, judged on flavour, was awarded to the Pittsworth Dairy Company (Yarranlea factory). The same company took first place in the class for cheese suitable for export, not over three months. The Downs Co-operative Dairy Association (Lillydale factory) was second. The judges stated that the quality of the Queensland butter was very fine, and reflected great credit on the manufacturers and the standard of efficiency attained by the factory managers. In connection with the competition of Australian butters entered in the Orient Line Jubilee Export class, in which sixty-one factories competed, recent cable advices from London indicate that the Downs Co-operative Dairy Association (Goombungee factory) tied with the "Norco" Corndale factory (N.S.W.) for the highest aggregate points in the Sydney and London judgments in both salted and unsalted classes. In the salted classes Queensland Farmers' Co-operative Association (Grantham factory) came second with 191 points, while the Goombungee factory also secured fourth place with 189½ points in conjunction with the Uki (New South Wales) factory. In the unsalted classes the Maryborough Co-operative Dairy Association (Kingaroy factory) shared second place with the "Norco" Company's Channon factory (New South Wales), while the Downs Co-operative Dairy Association (Goombungee factory) was equal for fourth place with two other New South Wales factories.

To enable the industry to secure the full benefits of the improvements being effected on the manufacturing side, added the Minister, there must be complete co-operation by the farmer with the factory, for in order to produce the highest quality butter and cheese it is necessary that the producer should supply cream and milk in the best possible condition. He complimented the Manager's Association on its activities and for its efforts to further improve manufacturing standards.

### Colour Prejudice in Corn.

THE Director of Agriculture (Mr. H. C. Quodling) has informed us that the proportion of red-tinted and red-coloured maize being marketed this season in Southern Queensland is so pronounced that buyers, who are on the lookout for yellow grain, have experienced great difficulty in getting even, whole coloured lines. The prejudice against this red-coloured grain is not confined to the interstate trade, as it is understood that distinctly coloured yellow grain is also being sought after for the overseas trade. Actually, there is little or no difference in quality between red and yellow grain. Growers, however, would be well advised when selecting their seed corn for the approaching season's planting to make sure that it is a whole coloured yellow variety. If action in this direction were general, there would be fewer complaints by buyers and better and more satisfactory marketing conditions could be anticipated in the future. It is hardly necessary to stress the importance of everyone concerned assisting in the "swing over" from red to yellow coloured grain, and in this direction the helpful efforts of seedsmen would be invaluable. A word of warning in relation to the source of seed supplies may not be out of place, so that diseases not known now in Queensland may be kept out. One serious disease

coming under this category is known as "root, stalk, and ear rot," which is readily set up by infected grain. Loss from this particular disease in New South Wales alone has been estimated on occasion as from 5 to 10 per cent., and it is practically impossible to tell whether or not apparently sound, healthy-looking grain is free from infection.

### **The Position of the Sugar Industry.**

**A** SURVEY of last year's operations generally reveals the present position of the sugar industry in Queensland. With the exception of that of 1925 the 1927 crop was the best yet harvested. The Statistician's figures for the term are not yet available, so the results now given must be regarded as approximate only. The present embargo on imported sugar expires next month, and the Federal Government has determined that it shall be renewed for a further term of three years as from August, subject to the same prices and conditions that obtain under the existing embargo. This was essential to the Queensland industry, and its renewal gave the greatest satisfaction to all sections employed in it, besides winning the approval of all who take the long view of national affairs.

In 1927 the total area under cane was just about 300,000 acres, an acreage considerably in excess of that of the previous year. The area from which cane was crushed was 211,762 acres, also an excess over the 1926 figures by 22,450 acres. The total tonnage of cane harvested was 3,554,289 tons, from which it is estimated that approximately 483,000 tons of 94 n.t. raw sugar were extracted. This yield was much higher than that of 1926, exceeding it by 94,000 tons. It was just short of the 1925 record, which was 485,585 tons. The acreage yield was about 16.7 tons, as compared with 15.45 tons per acre in 1926. The sugar yielded per acre, 2.2 tons, was also better than that of the previous year. The quantity of cane required to make 1 ton of sugar was about 7.3 tons, which was the lowest on record, the commercial cane sugar in the product last year being particularly good. In this factor much improvement has been shown in recent years, which is due to the higher efficiency of the raw sugar mills, better varieties of cane, the regulation of cane prices, and the work of the Bureau of Sugar Experiment Stations. The excess of the sugar produced over home needs amounted to 152,400 tons. The price paid to the mills was £22 0s. 4d., or £2 10s. 6d. less than in 1926. The percentage which went into home consumption was 68.8181, while the net value of the sugar exported was £12 2s. 6d. per ton n.t. The estimated consumption in the Commonwealth is somewhere around 333,000 tons per annum. There is no information at present available on the molasses output, but it is anticipated that, with power alcohol plants operating at Sarina and elsewhere, this will be an important industrial and economic factor in the near future.

### **The Present Seasonable Outlook.**

**T**HE present sugar season has opened out very promisingly, and it is expected that the 1925 record should be exceeded. Grub damage, however, has been severe, particularly in the North, and grubs have also appeared in districts hitherto regarded as quite free from the pest. Their prevalence this year is due largely to congenial seasonal conditions. The Bureau of Sugar Experiment Stations, which is part of the excellent organisation which is characteristic of the whole industry in Queensland, is extending somewhat its beneficial influence. Its staff of trained men has been largely increased, and the services of student scientists who were sent abroad as the holders of Travelling Scholarships are now available to the growers and millers. Of the travelling scholars two, Messrs. Bell and Bennett, whose work has been in cane pathology and sugar technology respectively, are now actively employed. A third, Dr. Kerr, whose overseas studies have taken in soils physics and chemistry, is expected to return this year. The work of these young and gifted Queenslanders should be of the greatest value to the industry.

The propagation of new seedling canes is being carried out on an extensive scale, and this activity is of the utmost importance to the farmers. The new canes are, of course, tested for their commercial value as well as to their resistance to disease.

In respect to general educational guidance, the Queensland sugar-grower has very little to complain about, and probably no primary industry in Australia is so well advanced along the lines of scientific organisation. This is as it should be, and, in fact, the sugar-growers have set a high standard and an impressive example to farmers in the other departments of rural enterprise.

# Bureau of Sugar Experiment Stations.

## FERTILISER RESULTS AT BUNDABERG.

The following data on the use of fertilisers in sugar-cane cultivation have been supplied by several Bundaberg farmers to the Bureau of Sugar Experiment Stations, and in every case show a profit that has well paid the grower for manuring. These are the results of local experiments that have been mentioned by Mr. J. C. Murray, Southern Field Officer to the Bureau, in his reports from time to time. As the growers concerned have requested that their names should not be mentioned, a distinguishing letter is affixed to the various examples:—

### FARM A, BUNDABERG.

Soil, red scrub loam. Cane value at mill, 37s. per ton.

Manure Applied per Acre.	Tons of Cane per Acre.	Increased Yield due to Fertilisers in Tons Cane per Acre.	(a) Cost of Manures, and (b) Application.	Increase in Value of Crop due to Fertilisers.
Bonemeal, 6 cwt. . . . .	25.0	5.0	£ s. d. (a) 5 8 0 (b) 0 5 0 5 13 0	£ s. d. 3 12 0
Sulphate of Potash, 3 cwt. . . . .				
No Manure . . . . .	20.0	..	..	..

### FARM B, BUNDABERG.

Soil, red scrub loam. Cane value at mill, 37s. per ton.

Manure Applied per Acre.	Tons of Cane per Acre.	Increased Yield due to Fertilisers in Tons Cane per Acre.	(a) Cost of Manures and (b) Application.	Increase in Value of Crop due to Fertilisers.
4 cwt. Mixed Manure containing— 9% Nitrogen	22.0	4.0	£ s. d. (a) 3 4 0 (b) 0 0 5 3 9 0	£ s. d. 3 19 0
7% Phosphoric Acid (as bone)				
11% Potash as Muriate				
No Manure . . . . .	18.0	..	..	..

### FARM C, BUNDABERG.

Soil, red forest loam. Cane value at mill, 36s. per ton.

Manure Applied per Acre.	Tons of Cane per Acre.	Increased Yield due to Fertilisers in Tons Cane per Acre.	(a) Cost of Manures, and (b) Application.	Increase in Value of Crop due to Fertilisers.
4 cwt. Bonedust . . . . .	20.0	2.0	£ s. d. (a) 2 0 0 (b) 0 5 0 2 5 0	£ s. d. 1 7 0
No Manure . . . . .	18.0	..	..	..

**FARM D, BUNDABERG.**

Soil, red forest loam. Cane value at mill, 36s. per ton.

Manure Applied per Acre.	Tons of Cane per Acre.	Increased Yield due to Fertilisers, in Tons Cane per Acre.	(a) Cost of Manures, and (b) Application.	Increase in Value of Crop due to Fertilisers.
			£ s. d.	£ s. d.
3 cwt. Bonedust and 1 cwt. Sulphate of Potash .. .. }	22.0	4.0	(a) 2 8 0 (b) 0 5 0 2 13 0	4 11 0
No Manure .. .. . }	18.0	..	..	..

**FARM E, BUNDABERG.**

Soil, red forest loam. Cane value at mill, 37s. per ton.

Manures Applied per Acre.	Tons of Cane per Acre.	Increased Yield due to Fertilisers, in Tons Cane per Acre.	(a) Cost of Manures, and (b) Application.	Increase in Value of Crop due to Fertilisers.
			£ s. d.	£ s. d.
4 cwt. of Mixed Manure, containing— 3½% Nitrogen .. .. }	20.0	5.0	(a) 2 10 0 (b) 0 5 0 2 15 0	6 10 0
12% Phosphoric Acid (as bone and superphosphate) .. }				
12% Potash (as sulphate) .. }				
No Manure .. .. . }	15.0	..	..	..

**FARM F, BUNDABERG.**

Soil, red forest loam. Cane value at mill, 37s. 6d. per ton.

Manure Applied per Acre.	Tons of Cane per Acre.	Increased Yield due to Fertilisers, in Tons Cane per Acre.	(a) Cost of Manures, and (b) Application.	Increase in Value of Crop due to Fertilisers.
			£ s. d.	£ s. d.
4 cwt. of Mixed Manure, containing— 7% Nitrogen .. .. }	20.0	5.0	(a) 2 17 6 (b) 0 5 0 3 2 6	6 5 0
10% Phosphoric Acid (as bone) .. .. . }				
10% Potash (as muriate) .. }				
No Manure .. .. . }	15.0	..	..	..

**THE LUNDABERG EXPERIMENT STATION AND THE GUMMING DISEASE SITUATION.***The Bureau of Sugar Experiment Stations has issued the following report:—*

In common with most other farms in the Bundaberg district, gumming disease became established on the Bundaberg Experiment Station a few years ago. The result has been that the hitherto standard varieties have suffered great losses in both tonnage and purity, and have reached the stage where it is impossible to continue to grow these varieties profitably. In order to cope with this situation the Director, in 1926, ordered the ploughing out of all susceptible canes, and their replacement with resistant varieties. Of the latter, Q. 813 appeared by far the most promising, and has accordingly been planted extensively, and is now the main variety on the Station; the only other varieties grown are those which are being tested for resistance to gumming.

Cane may be infected with gumming in a variety of ways, but by far the most important mode of spread is from leaf to leaf during wet windy weather (see an article by Mr. D. S. North in the "Australian Sugar Journal" for August, 1927). The causal bacteria enter the leaves through wounds in the epidermis, and after about two weeks the typical yellowish streaks appear on the leaves. The zone of infection may remain confined to the leaves, but in susceptible varieties it extends down into the stem as soon as the cane receives a check in growth—i.e., during the winter or drought periods. Once the disease has passed into the stem it becomes systemic, and it is in this comparatively late stage that the gum oozes from the cut ends of the stem. There are no commercial canes known to be immune to gumming, but there are a number which are highly resistant, and which, if exclusively grown, would soon serve to eradicate the disease from the district. Q. 813 must be placed in this class of highly resistant canes. When exposed to sources of heavy infection this type of cane will contract the disease, but, apart from exceptional circumstances, the infection is confined to the leaves and does not pass down into the stem. The disease thus fails to become systemic, and the cane should become completely healthy with the shedding of the infected leaves. Since gumming is spread only in wet windy weather, it follows that during a period of dry calm weather there would be no secondary spread, and a crop of a highly resistant cane would soon tend to become quite healthy again. The bacterium which causes gumming appears to live only in the sugar-cane plant, and cannot live in the soil or trash. From these considerations it will readily be understood that gumming could be eliminated from the Bundaberg district if every farmer grew canes which are highly resistant and those canes only. Strict attention must be paid to the eradication of the small collections of nondescript varieties which are found on most farms. After the elimination of the disease it should then be possible to return to the old susceptible varieties if that were desired.

The extensive plantings of Q. 813 will be harvested at the Station this year, and it is confidently expected that the experiment will prove the possibility of growing a comparatively healthy crop of a resistant cane even when surrounded by badly diseased fields. As long as the growers immediately adjacent to the Station continue to plant susceptible varieties it will be impossible to maintain the Station fields in a disease-free condition, as it is known that the causal bacteria are carried by flies over considerable distances. It must be emphasised here that all attempts at the control of gumming should not be sporadic but must be practised simultaneously over the entire district.

Unfortunately, the problem of securing resistant varieties which are suitable for the particular class of soil is exceedingly difficult in some sections of the Bundaberg district. Q. 813 is quite unsuitable in some areas, but should be grown wherever possible, as, in addition to being highly resistant to gumming, it is also resistant to Mosaic and Fiji diseases. The Bureau has recently imported from the West Indies two canes which there are resistant to gumming, and yield high tonnages of sugar; these will soon be available for field tests at the Station. In March a shipment of the famous Java cane (P.O.J. 2878) was received; Javanese experience suggests that this cane should do well under somewhat adverse conditions, but naturally nothing is known of its resistance to gumming. Arrangements have been made to introduce a number of specially selected canes next spring; the parentage of these canes leads us to believe that the majority of them should prove resistant to gumming. In addition, a number of the South Johnstone seedlings are already undergoing field tests for gumming resistance, and several varieties are showing promise.

Next year it is hoped to extend the breeding programme of the Bureau, and special attention will be paid to breeding canes for the double purpose of gumming resistance and tolerance of unfavourable climatic conditions.

## THE ATHERTON TABLELAND.

*Mr. J. H. Buzacott, Assistant Entomologist to Mr. E. Jarvis, Entomologist of the Bureau of Sugar Experiment Stations, reports:—*

Atherton Tableland was visited in order to make a study of the insect pests affecting sugar-cane growing in the district, and also with a view to comparing pests found there with those occurring at lower altitudes.

Unfortunately, wet weather was experienced throughout the whole duration of the visit (March, 1928), and thus little opportunity was afforded for the collection of a representative group of insects.

There is very little cane growing on the Tableland now, although many of the farms have a small patch for feeding pigs and stock, but most of this was poorly

cultivated, and Mosaic was common. On account of the small plots of cane insect pests were also collected from nearby maize, but the number of serious pests encountered was few.

The chief insects met with are listed below:—

### Orthoptera.

Grasshoppers were doing the most damage, mainly *Locusta danica*, *Locusta australis*, and a thin long-legged green grasshopper which was far more prevalent on the Tableland than on the coastal lowlands.

The common cane cockroach (*Ellipsidion* sp.) was on the cane and corn in large numbers.

### Army Worms.

Various species of army worm caterpillars were collected, and among the adults bred out have been *Cirphis unipuncta* and *Mocis frugalis*.

A fungus disease was found to be attacking many of the caterpillars there—this disease somewhat resembling the green muscardine fungus (*Metarrhizium anisopliae*) which attacks cane grubs and other insects.

### Other Pests.

Aphides were present in large numbers on the maize, whilst on surrounding grass land the small black leaf-eating beetle (*Rhyparida morosa*) was very numerous.

Judging by the presence of click-beetles in the corn, their larvæ, known as wire-worms, were probably operating at the roots.

Specimens of a skipper butterfly (*Parnara mathias*) were captured in cane, and also two larvæ of it, one of which was parasitised by a Braconid wasp, were found on cane leaves. This skipper has been recorded before as attacking sugar-cane in North Queensland.

Among the beneficial insects observed were male digger wasps (*Campsomeris* sp.), Robber flies, and earwigs.

As stated above, on account of the wet weather, this could hardly be termed representative of the Tableland insects, and of those specimens collected or seen there was not one species which is not known to commonly occur on the lowlands in the Cairns district.

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## CANE CULTURE IN THE PHILIPPINES.

By ARTHUR F. BELL.

The Philippines constitute a large group of islands lying to the south-east of continental Asia, and extending from latitude 4 degrees north to 20 degrees north. The group contains over 1,400 islands, with an aggregate area of over 120,000 square miles. The native population is of the Malayan race, and has many characteristics in common with the Javanese; the type of native and the dialect spoken vary somewhat as one passes from island to island. In the sixteenth century the Philippines came under the domination of the Spaniards, and the Spanish rule persisted until the Spanish-American war of 1898, when the group became an insular possession of the United States. Since that time the development of the country has been greatly accelerated, due to the introduction of American system and capital, and the exemption of Philippine products from payment of the heavy import duties of the United States. With the exception of the very small islands of Porto Rico and the Hawaiian group, the Philippines constitute the sole tropical possession of the United States, and as such are of great importance to that country. It is well known that continental United States is dependent upon other countries for its enormous requirements of coffee and rubber, and to a large extent sugar, and the Philippines are potential suppliers of the entire needs of these tropical commodities.

### Economic Conditions.

Although sugar-cane has been grown commercially for very many years, the Philippine industry must be considered as being in the infancy of its development. Only a small proportion of the available land is at present devoted to cane culture, and this land is confined to the two islands Luzon and Negros, the latter being the

more important. For the season 1926-27, the total production was nearly 500,000 tons of raw sugar, the greater part of this being exported to the United States. There has recently been some agitation to persuade the United States Congress to limit the quantity of Philippine sugar which shall be admitted duty free, and the amount suggested was 500,000 tons. Should this proposal come into effect, it will naturally be a serious blow to the future of the Philippine sugar industry. On the other hand, next to Java, the labour is probably the cheapest in the sugar world, and the profitable production of sugar should soon be achieved even without the assistance of the American tariff barrier.

### Cane Varieties and Yields.

To achieve this end it will be necessary to bring about an almost complete change-over in the varieties of cane grown. At the present time the bulk of the crop is composed of the so-called "native" canes, Luzon White, Luzon Red, Cebu Purple, Negros Purple, &c., canes which yield neither heavy crops nor rich juices, and which cannot be ratooned successfully. It seemed to me that the yield per acre could probably be increased by at least one-third, merely by the substitution of varieties which are already in the country. Moreover, these varieties will yield two or three ratoon crops, thus eliminating the necessity and cost of planting every year. Of these new varieties, Badila is one of the most promising varieties being grown on the island of Negros, and is giving an average yield (both plant and ratoon) of about 25-30 tons per acre for a twelve months crop. Whether Badila will become the standard variety, or whether it will be but a transition variety while other varieties are developed and tested, remains to be proved.

Exhaustive tests of the yielding capacities of different varieties are now being carried out under the direction of H. Atherton Lee, late Chief Pathologist to the Hawaiian Sugar Planters' Association, and now Director of Research to the Philippine Sugar Association. In addition to his high scientific attainments, Mr. Lee is equipped with sound practical knowledge and judgment, and I consider that the experiments which he has just set out promise to be among the most thorough which I have ever seen in any sugar-cane country. His current programme consists of at least one variety trial and one fertiliser trial in the lowlands and uplands of each mill district. Each experiment is laid out so that there are ten plots of the control and ten plots of each of the experimental treatments. Each plot occupies an area of a quarter acre; these will be harvested separately, the results examined mathematically, and the true significance of any differences in results ascertained. After the standard varieties and the best fertiliser practices have been determined, the programme will be extended to include experiments on cultural operations, &c.

### Farm System.

Unlike Java and Hawaii, the industry is not conducted on the estate system, but approximates to the farm system of Australia. The mill owns the permanent tramways, hauls the cane from the tramway siding, and is responsible for the allocation of cane cars to the individual farmers. At the beginning of the season an estimate is made of the total yield, and of the probable yield for each farm, and on this basis each farmer is allotted so many cars per day. This means, of course, that harvesting is going on each day on practically every farm. Each car is weighed as it comes into the mill and as a general rule the farmers are paid on the basis of 55 per cent. of the value of the sugar extracted from their cane, the mill retaining 45 per cent. Until comparatively recently the Calamba Sugar Company ran their properties on the estate system, but have now subdivided into farms of 15 acres, which are leased out to the Filipinos. This type of farmer is called an *Aparcero*, and pays a fixed rent according to the quality of his land; he may provide his own animals and implements, or these may be leased from the company. The company pays the *Aparcero* a flat rate of about £13 per acre for plant cane, providing the returns are up to standard; for every ton over 20 tons per acre on first-class land, and 18 tons on second-class land, the *Aparcero* receives a bonus. The contracts dealing with the leasing of the land specify that the *Aparcero* must do certain amounts of weeding and cultivation. The estate is divided up into a number of divisions, and in each division there is one farm set aside for experimental and demonstration purposes.

### Climatic Conditions.

The two islands of Negros and Luzon differ considerably in so far as their climates are concerned. Although the total rainfalls are of the same order, the distribution is more even on Negros, and there is not the pronounced dry season to be found on Luzon. There are small irrigation schemes for the purpose of

growing rice—the staple food of the country—but all cane is grown under the conditions of natural rainfall. The planting season is during the dry months, and this is no doubt one of the reasons why Badila is not grown with much success on Luzon. It is the general practice to use top seed; special gangs go in one or two days ahead of the canecutters, and top the cane, so that planting and harvesting must be carried out at the same time. In some places the seed is soaked in water for about twenty-four hours before planting, but the majority of farms have not the facilities for doing this. (With reference to this practice, it is interesting to note that in Java, where hot water treatment of seed was beginning to be adopted for the control of scorch, it was advised that the seed should be dried for twenty-four hours after this treatment.) It is claimed that if top seed is well covered with trash it will keep in good condition for a period of about three weeks. Owing to the weed problem, the cane is planted very closely and some 10,000-12,000 seed pieces are used per acre. Since this is all top seed, and since a good proportion of the cane tops are unsuitable for seed (e.g., cane which has arrowed), it will be evident that many areas suffer from a shortage of seed. One of the natural results is that seed selection against such diseases as mosaic is rendered difficult, and it is becoming necessary for a certain amount of body seed to be used in order to permit of the necessary seed selection.

The comparatively high rainfalls are responsible for the rapid growth of weeds, and the control of these presents a serious problem, especially on Negros, and represents a considerable item in the costs of production. In order that the cane will close in as quickly as possible, it is the practice to place the rows only about 4 feet apart.

### Methods of Cultivation.

Tractors are not in wide use, except on the Calamba Estate, but their numbers are increasing; on Calamba the tractors are owned by the estate, and the ploughing is done for the Aparcedo at approximately cost rates. At present, most of the cultivation is done with small native ploughs drawn by caribao (water buffaloes), and while the rows are spaced only 4 feet apart, it is unlikely that light tractors can be used successfully for cultivating between the rows. It is the custom to burn off all trash, but fallowing is practised to some extent, and the use of artificial fertilisers is increasing each year. Recent experiments on the Calamba Estate have demonstrated the advantages of cultivation for ratoons immediately after the cane has been cut. The management has now made it a rule to cultivate with a disc harrow within two days of harvesting; this is done diagonally across the field twice and then off-barring is carried out as soon as possible, and at least within two weeks. From the standpoint of cultural methods, the limiting factor in the Philippines is undoubtedly the very poor drainage found in most parts of the islands, standing water being a common sight even after only moderate falls of rain.

### Diseases and Pests.

Although a large proportion of the more serious sugar-cane diseases is present in the Philippines, nevertheless, the aggregate loss due to disease does not appear to be very great, except in the districts heavily infected with mosaic. Whether this condition will continue in the face of the change-over to sweeter varieties of cane is another question, but no doubt adequate tests will be made for disease resistance before the planting of any particular variety is advised. Leaf-scald, mosaic, Fiji, smut, and Bunga are the most important diseases present; downy mildew was found on one property in 1921, having been introduced from Formosa, but now appears to have been eradicated by roguing.

### Field Experimental Work.

Most of the field experimental work is conducted under the supervision of the technical staff of the Philippine Sugar Association; this organisation has no experimental station at present, but there is little doubt that one will be established in the near future. In addition to the Director, there is a superintendent on each island and an experimentalist attached to each mill, the latter being responsible for the detailed supervision of any experiments. The Philippine Bureau of Science has been responsible for a considerable amount of work with sugar-cane, especially in sugar-cane pathology. The College of Agriculture at Los Banos provides courses in agriculture, and the technology of sugar manufacture, and has a well-equipped model mill for the instruction of the students. Excellent contributions to tropical pathology have been made from this department of the college. The Genetics Department is carrying out an extensive programme of seedling raising, this being

the only cane-breeding station in the islands. The method of crossing is similar to that adopted in India, i.e., the stalk of the male parent is surrounded by a bamboo cylinder containing soil, and after the production of roots in this soil the stalk is cut off below the cylinder and the rooted stalk and arrow are carried to the female parent which is left growing in the field. Some 50,000 seedlings are germinated annually in flats in the open air, and about 2,000 of these are selected when 12 to 18 inches high, and are then planted out in the field and selected at maturity on the basis of visible characters, weight, and analysis.

### Labour Conditions.

The situation with regard to labour is somewhat paradoxical, since the Philippines are "exporters" of indentured labour to the sugar fields of Hawaii and yet most of the Philippine sugar districts suffer from a shortage of labour. This situation arises from the fact that the island of Negros is very thinly populated, and the natives of the neighbouring islands are somewhat averse to leaving their homes for seasonal work. On the other hand they are quite ready to be transplanted to Hawaii where they are assured of continuous work and a wage of about 5s. per day as compared with about 1s. 6d. per day in the Philippines. However, this labour shortage is never likely to be a very serious factor, and the situation will no doubt improve from year to year.

In conclusion, it must be stated that, pre-supposing the continuance of some measures of protection and freedom from serious political strife, the future of the Philippine sugar industry appears to be exceptionally bright.

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### FIELD CROPS FOR DAIRYMEN.

"I wish that we could get all dairy farmers to realise the advantages to be gained by the growing of wheat, oats, or barley with field peas or vetches, as a means of providing a succulent feed that will be available from August to October, in Queensland," said Mr. A. E. Gibson, Instructor in Agriculture, recently.

"We have prepared a booklet illustrating crops that have been grown, and giving full particulars as to sowing and yields. The Department will be glad to send a copy to any reader of the Journal.

"We have found that 'Prince' and 'Patriot' wheats and 'Skinless' and 'Cape' barley do wonderfully well. So does Ruakura oats.

"In an experiment at Beaudesert, the varieties of wheat—'Prince' and 'Patriot'—made excellent growth, having but slight indications of rust. Although they were knocked about considerably by wind and rain prior to harvesting, they did not suffer any serious damage.

"During the early stages of growth, the barleys suffered damage from excessive rains, which caused them to lodge; opportunity was taken to make a first cutting, this being effected ten weeks from the date when the young plants first appeared above the ground. A subsequent cutting was made at a later date, details of which appear in tabulated form. Cape barley made most remarkable growth, but that of 'skinless,' subsequent to the first cutting, was somewhat thin.

"The sowing at Beaudesert was made on 16th May. That is rather late. Earlier sowing would be better. We got 18 tons 18 cwt. of Ruakura oats and peas, and 15 tons 2 cwt. of Cape barley and vetches.

"On Mr. A. Hulse's farm at Yandina we got a yield of 16 tons 16 cwt. of 'Prince' wheat and peas, and 12 tons 3 cwt. of Cape barley and peas. These are good yields on rich, alluvial country."

Mr. Gibson recommends the following quantities of seed per acre:—

Wheat, 30 lb., Dun field peas or Black Tares, 20 lb.

Barley, 40 lb., Dun field peas or Black Tares, 20 lb.

Rye, 30 lb., Dun field peas or Black Tares, 20 lb.

Oats, 30 lb., Dun field peas or Black Tares, 20 lb.

Canary seed, 10 lb., Dun field peas or Black Tares, 20 lb.

Wheat, alone, 60 lb. per acre.

Barley, alone, 50 lb. per acre.

Oats, alone, 40 lb. per acre.

Rye, alone, 60 lb. per acre.



Fig. 1  
Egg x 5

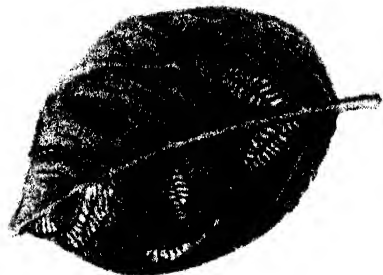
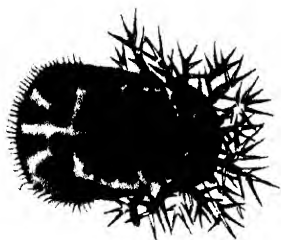


Fig. 2  
Egg x 5

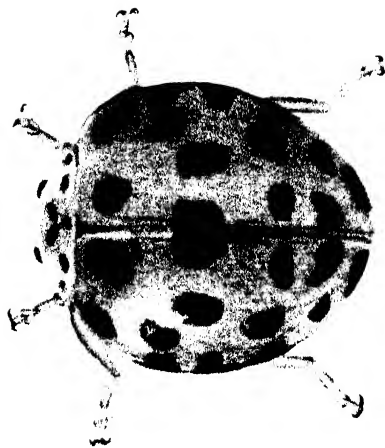


Fig. 3  
Larva x 5

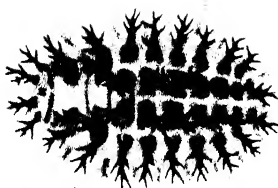


Fig. 4  
Pupa x 5

## THE LEAF-EATING LADYBIRD.

By MARGARET E. TEMPERLEY, B.Sc., Entomological Branch.

Every year the Department of Agriculture and Stock receives numerous reports concerning the depredations of the leaf-eating ladybird, *Epilachna 28-punctata* Fab., a small beetle belonging to the family Coccinellidae. Last year was no exception, and in November and December the Chief Entomologist advised many inquirers concerning the control of this pest.

In late spring and early summer the beetle appears in large numbers, causing extensive damage to crops produced by the farmer and market gardener, both larvæ and adults feeding on the leaves of the host plant and in cases of gross infestation resulting in complete defoliation.

The various stages of this insect were described by Olliff<sup>2</sup> in 1890, but no detailed work appears to have been published regarding its life history. Accordingly, at the suggestion of Mr. Veitch, a brief study of this insect was commenced in December, 1927, and as a result some additional information has been obtained regarding the life cycle stages of this pest, the details of which are recorded in these notes.

### Geographical Distribution.

*Epilachna 28-punctata* has been recorded as occurring in China, Japan, India, Ceylon, the Philippine Islands, the Malay Archipelago, New Guinea, Australia, and Fiji. In Australia it flourishes in the warmer parts, extending from New South Wales through Queensland to the Northern Territory.

### Food Plants.

The widespread distribution and abundance of this beetle is due to its ability to change readily from one food plant to another. Among cultivated plants in Australia, potatoes, tomatoes, and pumpkins are more commonly attacked, while cucumbers, cotton, and rockmelons are also infested. *Solanum nigrum* or Nightshade and *Datura stramonium* or Trumpet Flower are the two most common weeds which serve as food plants for this pest, while it is also found feeding on many other solanaceous and cucurbitaceous plants. In other countries tobacco and egg-plant are recorded as hosts.

### Nature of Injury.

As is well known the majority of the Coccinellidae or ladybird beetles are beneficial insects, and are worthy of protection on account of the fact that in both the larval and adult stages they are predatory on aphids and scale insects. A few species belonging to the Epilachninae, however, are plant feeders, and cause much damage to crops.

In the species under consideration both larvæ and adults are vigorous feeders, the larvæ exhibiting a marked preference for the under surface of the leaf, while the adults are found feeding on both

surfaces. Ragged patches are eaten out of the leaf, leaving a thin film of cuticle on the opposite side (Plate 1, Fig. 5). The adults frequently eat right through the leaf. A badly damaged leaf has a lace-like appearance, the tissue of the leaf being eaten away in patches, the patches being fairly close together with narrow intervening strips of undamaged tissue. A few of these insects feeding on the leaves merely retard the growth of the plant, but when present in large numbers defoliation may take place and the plant may die. Cases of severe infestation have been recorded where even the denuded stems were completely destroyed.

### **General Description and Life History.**

In completing its life cycle this insect passes through the following different stages:—(1) The egg, (2) the larva, (3) the pupa, and (4) the adult.

#### **The Egg.**

The egg of this beetle is cigar-shaped, yellow in colour, and measures about one-sixteenth of an inch long (Plate 1, Fig. 1). The surface is hexagonally sculptured. Oviposition takes place during the day, the eggs, in the cases observed in this investigation, being laid in clusters on the under surface of the leaf. In clusters taken in the field, from 13 to 45 eggs were found in each, while in the laboratory the number of eggs per cluster ranged from a minimum of 9 to a maximum of 32. The details of the latter are shown in Table II.

The incubation period of the egg in the cases observed, remained remarkably constant at four days. The first signs of development are visible on the third day, when the ocelli or eyes of the larva can be seen at the apex of the egg with the aid of a lens. On the fourth day, the top of the egg becomes ruptured and the young larva emerges, clinging to the empty eggshell or remaining near the hatching site for several hours before wandering off in search of food.

#### **The Larva.**

The larva is yellow bodied and presents a rather formidable appearance, being clothed from the region of the head to the posterior extremity with stiff branched spines (Plate 1, Fig. 2). The spines are light coloured with dark-brown tips. The larva increases in size by a series of moults, whereby the old skin, which has become too small for the larva, is cast off and is replaced by a new and larger skin which formed underneath the old one. Four such moults occur in the larval stage. The duration of the larval stages is given in Table I. A somewhat technical description of the larval instars is given after the discussion of control measures.

The full-grown larva measures about three-eighths of an inch long and the rectangular areas surrounding the base of the spines are defined with dark-brown thickenings, which become more pronounced as the larva approaches pupation.

When disturbed the larva secretes drops of bright yellow fluid. The mature larvae are gregarious and gather together on the stems and under surfaces of the leaves prior to pupation.

About two days before pupating the larva enters its prepupal stage, becoming attached to the stem or leaf at its anal extremity by means of a viscid secretion. It ceases feeding and the body becomes shorter and broader. The duration of the larval period averages nineteen days, the maximum and minimum periods being twenty-three days and seventeen days respectively in the cases under observation.

### The Pupa.

The pupa (Plate 1, Fig. 3) is oval in shape and measures about one-fourth of an inch long and three-sixteenths of an inch wide. It is attached at its posterior extremity to the under surface of the leaf or stem. The body of the pupa is creamy coloured with dark-brown markings. The last larval skin with its stiff spines covers the posterior segments of the abdomen. The insect remains in the pupal stage four days, at the end of which the pupal skin splits and the adult emerges.

The total life cycle period from egg laying to the emergence of the adult averages twenty-seven days in summer. The full details are given in Table I.

### Adult or Beetle.

The newly-emerged adult (Plate 1, Fig. 4) is bright yellow and is devoid of dark markings. The body is extremely soft, but on exposure to the sun and air soon hardens and after half an hour or so the spots can be seen very faintly. These become more pronounced until finally within a couple of hours after emergence they are densely black, while the ground colour has changed to a yellowish-brown.

The beetle is oval in shape, being broadest in the region behind the head and having the extremity of the abdomen more or less pointed. The under surface is flat, while the upper surface is strongly convex. In length the beetle is one-fourth of an inch and in breadth three-sixteenths of an inch at the widest part. The body varies in colour from light to dark yellowish-brown and is spotted with black. The head is somewhat retracted into the prothorax and bears a pair of black eyes. The antennæ are yellow with brown clubs, while the mandibles and palps are also tipped with brown. The ventral surface is light to dark brown in colour and the legs are yellow with brown tarsal claws. The prothorax bears from 2 to 7 black spots. These spots vary in size as well as arrangement, and adjacent spots frequently coalesce. The spots on the wing-covers are variable in both number and size. Gurney<sup>1</sup> states that there may be from 24 to 28 spots on the elytra. Mulsant has given specific names to some of these variable forms of *E. 28-punctata*, one of which was described by Tryon<sup>2</sup> in 1889 as having 26 spots on the elytra and which he refers to as *E. multipunctata* Muls.. The beetles examined were uniformly 26 spotted, each elytron bearing 13 black spots, the spots exhibiting variation in size in different specimens. From Tryon's description it is believed that the insect referred to is identical with the one studied in this laboratory.

The body is covered with a very fine pubescence. The female is slightly larger than the male, being distinguished from the latter by a median slit on the ventral surface of the last abdominal segment.

### Habits of Adult.

The adults only fly short distances; when disturbed they fall off the plant and feign death, drawing the legs in flat against the abdomen. When handled they secrete a bright yellow fluid from the knee joints which is acrid smelling and is probably used as a defence against enemies.

In the laboratory and field, pairs were observed mating daily. Two females were confined in tubes with males and they commenced laying some sixteen to eighteen days after emergence, one laying 125 eggs, the other 252 eggs. Under natural conditions it is believed that the total number of eggs laid by a single female would exceed those laid under artificial conditions. The oviposition records are given in Table II.

### Natural Control Factors.

A small brown ant, *Pheidole megacephala* Fab., is under suspicion as being an active agent in keeping the ladybird in check. It was found swarming over the host plants of *Epilachna* on which numbers of newly-laid egg clusters, distinguished by their bright-yellow colour, were observed on the leaves, but comparatively few egg clusters from which larvæ were emerging were found, indicating the destruction of large numbers of eggs.

Two hymenopterous parasites, which were identified as *Stomatocercus colliscutellum* Gir. (Plate 1, Fig. 6), were bred by Mr. I. W. Helmsing from pupæ collected on 12th November, 1927, at Maryborough.

### Artificial Control.

Immediate action should be taken to check the increase of the pest as soon as the first signs of attack are noted. This insect has biting mouth parts, so a stomach poison must be used which can be spread in a thin layer over the surface on which the larvæ and adults are feeding and so be taken into the stomach.

Lead arsenate is found to be the most satisfactory poison and is procurable in both paste and powder form. When mixed with water it is applied to the plant in the form of a spray, care being taken to see that the under surface of the leaves are sprayed, for it is there that the larvæ feed.

Where powder is used the following proportions are advisable:— $1\frac{1}{2}$  lb. lead arsenate to 50 gallons of water. Before adding the bulk of the water to the powder it is necessary to mix it into a thin paste, using only a small quantity of the water.

If the paste is used it should be prepared as a spray in the proportions of 3 lb. of lead arsenate to 50 gallons of water.

### Cultural Measures.

In cases of severe infestation the crops should be ploughed under so as to destroy thousands of eggs, larvæ, and pupæ. Weeds which serve as food plants should be destroyed even when no crops are planted.

### Description of Larval Instars.

*1st Instar.*—Average length 1.5 mm., breadth .52 mm. Body yellow bearing six longitudinal rows of fairly stiff branched spines, except on the prothorax where there are four and the last two abdominal segments where there are none. The spines are arranged in two dorsal, two latero-dorsal, and two latero-ventral rows. Spines dirty yellow with brown tips, base of spines dirty yellow. Head dirty yellow, ocelli brown, tips of mandibles reddish brown, legs yellow, tarsal claws brown. The abdomen tapers posteriorly, the last few segments being recurved and forming an attachment for the larva.

*2nd Instar.*—Average length 2.5 mm. Larva similar to previous instar except that spines are more branched.

*3rd Instar.*—Average length 3.4 mm. Similar to previous instar, spines more branched, faint brown markings partly surrounding base of prothoracic spines.

*4th Instar.*—Average length 6.8 mm. Body yellow, base of spines and spines dirty yellow, tips of spines dark-brown, spines much more branched than in any of the previous instars. Head dirty yellow, ocelli dark brown, mandibles reddish brown, legs yellow with brown tarsal claws. Rectangular base of spines becomes outlined with brown markings which surround or partially surround it, the thickenings becoming more pronounced as the larva approaches pupation. When fully grown the larva attains a length of 9 to 10 mm., the body becomes paler, the spines stiffen, the base of the spines becoming much darker and thicker.

TABLE I.

Series Number.	Incubation Period.	Period of larval instars in days.				Pupal Period in days.	Total Developmental Period.
		I.	II.	III.	IV.		
7 .. ..	4 days	4	3	5	7	4	Days. 27
8 .. ..		3	4	4	8	4	27
9 .. ..		4	3	5	7	4	27
10 .. ..		3	3	5	8	4	27
11 .. ..		4	4	4	7	4	27
12 .. ..		3	4	4	7	4	26
13 .. ..		3	3	6	8	4	28
14 .. ..		5	5	4	7	4	29
15 .. ..		4	7	5	7	4	31
17 .. ..		4	4	4	7	4	27
20 .. ..		6	3	3	6	4	26
21 .. ..		4	3	4	6	4	25
22 .. ..		4	3	4	7	4	26
Average ..	4	3.92	3.79	4.37	7.07	4	27.15

Period over which developmental studies were made extended from 29th December, 1927, to 3rd February, 1928. Average minimum temperature, 76 deg. Fahr.; average maximum temperature, 81 deg. Fahr.

TABLE II.

Series Number.	Date of Emergence of Beetle.	Date of Oviposition.	Number of Eggs Laid.	Period elapsing between emergence of beetle and oviposition.	Total Number of Eggs.
I.    ..    ..	27-12-27	14-1-28 15-1-28 19-1-28 22-1-28 23-1-28 24-1-28 26-1-28 28-1-28 31-1-28 3-2-28 11-2-28 14-2-28	23 19 10 17 19 23 25 27 32 20 19 18	} 18 days ..	252
II.    ..    ..	9-1-28	25-1-28 26-1-28 28-1-28 29-1-28 31-1-28 2-2-28 3-2-28	9 14 10 27 13 24 28	} 16 days ..	125

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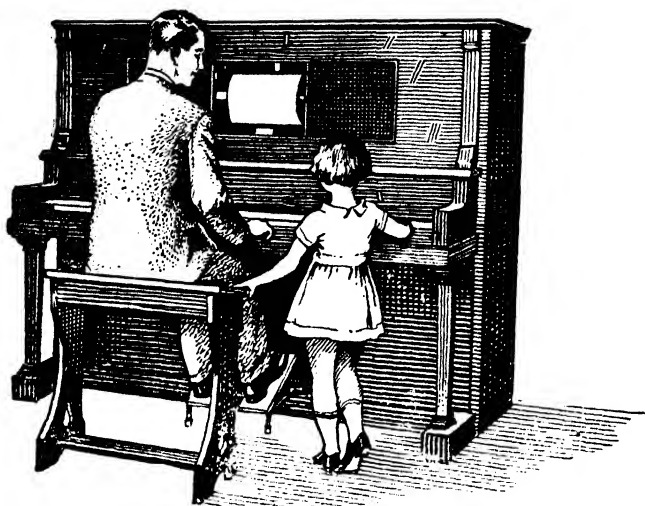
<sup>2</sup> Olliff, A. S., Agric. Gaz., N.S.W., Vol. 1, 1890, p. 281.

<sup>3</sup> Tryon, H., Annual Report of Department of Agriculture and Stock, Queensland, 1889-90, Insect and Fungus Pests, p. 181.



Photo.: Miss J. Easton.]

PLATE 2.—DOWN THE VALE—A SCENE ON COOCHIN COOCHIN.



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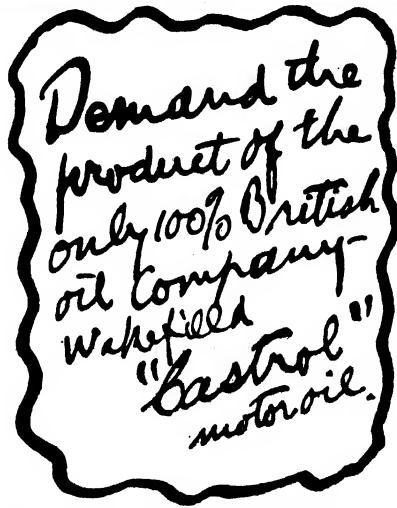


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# **AUSTRALIAN RURAL PROBLEMS.**

## **BUREAU OF AGRICULTURAL ECONOMICS.**

### **INTERSTATE MINISTERIAL CONFERENCE AT PERTH.**

**Perth was the venue this year for the Annual Interstate Conference of Ministers for Agriculture. Every State was represented, and the Western Australian Minister (Hon. H. Millington) presided. One of the most important subjects discussed was a Queensland proposal to establish a Commonwealth Bureau of Agricultural Economics. Subjoined are extracts from the report of the proceedings, which will be read with interest by Queensland farmers.**

The Conference opened on Tuesday, 5th June, and continued until the following Thursday. The delegates to the Conference were:—

*New South Wales.*—Hon. H. V. C. Thorby, M.L.A. (Minister for Agriculture), Messrs. G. D. Ross (Under Secretary, Department of Agriculture), T. MacInnes (Dairy Expert), C. G. Savage (Horticultural Superintendent), and H. Luckman (Secretary).

*Victoria.*—Hon. J. Cain, M.L.A. (Minister for Agriculture), Dr. S. S. Cameron (Director of Agriculture), Messrs. R. Crowe (Export Superintendent), J. Thyne (Secretary to the Minister), and J. M. Ward (Director of Horticulture).

*South Australia.*—Hon. J. Cowan, M.L.A. (Minister for Agriculture), Professor Perkins (Director of Agriculture), and W. L. Summers (Secretary to the Minister).

*Queensland.*—Hon. W. Forgan Smith, M.L.A. (Minister for Agriculture), Mr. E. Graham (Under Secretary for Agriculture), Messrs. T. G. Hope (Secretary), and C. McGrath (Supervisor of Dairying).

*Tasmania.*—Mr. F. E. Ward (Director of Agriculture), Messrs. T. H. Atkinson (Senior Dairy Officer), and P. H. Thomas (Horticultural Officer).

*Western Australia.*—Hon. H. Millington, M.L.A. (Minister for Agriculture).

Mr. Millington was elected as Chairman.

### **OPENING ADDRESS.**

The Chairman, in the course of his opening address, said that the Annual Conference of State Ministers was not merely a gathering for the exchange of formal courtesies, it was an assembly of major importance to all engaged, either actively or as administrators, in the general welfare and development of the great primary industries of Australia. They were not all satisfied with the progress being made, and no one realised more than Ministers and their officers the enormous amount of work ahead of them and the necessity for a periodical exchange of views through which a general policy in respect to interstate interests might be determined. They had also to consider their relationship with the Federal Government in respect to matters of mutual concern.

The Chairman went on to review the remarkable development of his own State from the gold mining days to the present period of vibrant agricultural prosperity. He then declared the Conference open for business.

### **CONFERENCE PROCEEDINGS.**

A summary of action taken in respect to the decision at the Adelaide Conference in 1927 was discussed in detail.

### Admission of the Press.

The question as to whether the Press should be present during the proceedings was raised.

Mr. FORGAN SMITH (*Queensland*) moved that the Press be admitted. They had everything to gain, he said, by the admission of the Press, and information on the matters they had met to discuss could not be disseminated too widely. The motion was carried.

The agenda was dissected, and several subcommittees were appointed to consider and report on the subjects submitted.

### Bureau of Agricultural Economics.

Mr. FORGAN SMITH (*Queensland*) moved that the Conference give very serious consideration to the most important question of the establishment of a Bureau of Agricultural Economics. The text of his able address is published elsewhere in this issue.

Mr. H. V. C. THORBY (*New South Wales*) seconded the motion. The general principles enunciated by Mr. Forgan Smith, he said, were sound. The general trend of his remarks was that each State should establish its own Bureau and look to the Federal Authorities for Commonwealth co-ordination. He gave the proposal his whole-hearted support, but he was emphatic that the work should be carried out in detail by the respective States, leaving to the Commonwealth the co-ordination of results.

Messrs. J. COWAN (*South Australia*), J. CAIN (*Victoria*), and F. E. WARD (*Tasmania*) supported the motion.

After inviting further discussion on the principle involved, the CHAIRMAN stressed the need of the States carrying out their own investigational work. He was in accord with the motion provided means for complete co-operation were devised. The scheme outlined by Mr. Forgan Smith was, he said, undoubtedly an Australian one, and they must have machinery to work it in a way big enough for an Australian policy. He congratulated Mr. Forgan Smith, and added that the Conference was in accord with him.

The complete resolution, which was adopted, was submitted in the following terms:—

**1. That it be a recommendation from this Conference that each State Department of Agriculture should establish an Economics Branch or Division.**

**2. That the State Parliaments provide such legislation (or amending legislation) as may be necessary to establish an facilitate the work of the Economic Divisions.**

**3. That the Commonwealth Government be asked to co-operate with the States in this matter by constituting an Agricultural Economics Committee under the Council of Scientific and Industrial Research. Each State Government, together with the Commonwealth Government, to nominate a representative to sit on such Agricultural Economics Committee.**

### Dingo Depredations.

The adoption by the State and Federal Governments of uniform methods for the protection of the live stock of the Commonwealth from the depredations of the dingo was affirmed on the motion of Mr. E. GRAHAM (*Queensland*).

### Restriction on the Importation of Stud Sheep.

The restriction on the importation of stud sheep into Australia by fee and by insisting on the provision of the certificate of a recognised breeders' society was approved on the motion of the CHAIRMAN.

**Uniform Grades and Standards.**

On a question raised by Mr. FORGAN SMITH (*Queensland*) as to the desirability of grading produce on uniform standards, Mr. THORBY (*New South Wales*) moved—

**“That Conference is strongly of opinion that it is undesirable to lower established standards of export products to meet temporary or seasonal conditions, and that the Commonwealth Government be informed accordingly.”**

The motion was carried.

**Fertiliser Control.**

The question as to the need of uniform legislation in respect to the control of the sale of fertilisers was affirmed.

**Salt Licks for Stock.**

The Conference affirmed the principle of compulsory registration and guarantee of salt licks for stock.

**Buffalo Fly.**

Mr. FORGAN SMITH (*Queensland*) moved—

**“That Conference is of opinion that measures should be taken by the Commonwealth and States concerned for the control and eradication of the buffalo fly.”**

The motion was carried.

**Educational Publications.**

Mr. FORGAN SMITH (*Queensland*) moved—

**“That the Commonwealth Government be requested to convey within the Commonwealth free of postal charges publications of an educational nature circulated by State Departments of Agriculture.”**

The motion was carried unanimously.

Much other important business was transacted at the Conference, and which must give additional impetus to the agricultural progression under able guidance now to be observed in every State in Australia. Queensland has adopted not only a progressive but an aggressive rural policy, and a recognition of this fact by the representatives of the other States is evident from a study of the lengthy record of the Conference proceedings.

After receiving the reports of the several subcommittees and adopting, in general, their recommendations, the Conference selected Melbourne as the venue for the 1929 assembly.

**A Tribute to the Australian Press.**

Before closing the proceedings, the Chairman (Mr. H. MULLINGTON, *Western Australia*) paid a graceful tribute to the daily Press of Australia. “I should like to express,” he said, “our appreciation to the Press for the manner in which the Conference proceedings were reported. They have not tried to pick out merely the titbits or something sensational. I believe the Press in Australia realises it is part and parcel of their duty to assist in agricultural development, and we depend upon them for disseminating such information as should be available to the people throughout Australia.”

The Conference then closed.

**THE JOURNAL APPRECIATED.**

*A Sarina farmer writes—*

*“The amount of information is splendid, in fact every subject is treated in the most scientific manner possible.”*

**BUREAU OF AGRICULTURAL ECONOMICS.****THE MINISTER'S SPEECH AT THE PERTH CONFERENCE.**

"In Australia we have laid down certain definite standards of living, and it is desirable that those standards should be maintained and made secure."

"Any system of social organisation must have as its starting point a sound agricultural policy."

"Men who are prepared to go on the land and encounter the vicissitudes of country life, granted that they are industrious, must have the right to a decent standard of comfort as high at least as the community can afford."—*Hon. W. Forgan Smith, at Perth.*

ONE of the most notable utterances on current rural problems delivered at the Interstate Conference of Ministers for Agriculture at Perth last month was the speech by Mr. W. Forgan Smith, of Queensland, on the question of setting up a Bureau of Agricultural Economics in each of the States with a fully representative Economic Committee of the Council of Scientific and Industrial Research as a co-operative and co-ordinating authority.

Subjoined is the text (abridged) of the address taken from the official report of the Conference proceedings.

**THE MINISTER'S ADDRESS.**

Hon. W. FORGAN SMITH: I move that the Conference give very serious consideration to this most important question. Everyone must realise the importance of investigation into the agricultural economics of Australia. The problem becomes increasingly pressing as modern development in industry takes place. In Australia we have laid down certain definite standards of living, and it is desirable that those standards should be maintained and made secure on a sound basis as the years go by.

This is of extreme importance in regard to the primary producing industry. Any method of social organisation in the country must have as its starting point a sound agricultural policy. In order that this may be done, measures must be taken to ensure that those engaged in the production of the essentials of life shall be made as comfortable as possible and their conditions attractive. In other words, men who are prepared to go on the land and encounter the vicissitudes of that form of industry, granted they are industrious, must have the right to a decent standard of comfort of as high a character as the community can afford. The problem is as to how it is best to develop the country, and the resources of the country, in the interests of the people who are living in it.

**Economic Waste.**

Our methods of production indicate that there is much waste going on. No concerted effort is made to produce for the new needs of the country or the new needs of the markets we are endeavouring to supply. There is no co-ordination in the various activities in which we are engaged. Each of the States seeks to develop its industries in its own way, and often no information is available from the results of the activities in which they are engaged. Take, for instance, the development of the various forms of settlement immediately following upon the war. In connection with the soldiers' settlements schemes, all the States induced men to go on the land without having investigated the fields of production or the marketing of the product. All the States have experienced great loss in that way, but that is not the worst phase of it from the point of view of the State. There is the loss of energy and the discouragement that is brought about by the partial failure of settlers who have been placed on the land, without being able to establish themselves fairly and effectively.

**Arresting Figures.**

In addition, we find on a review of the Commonwealth statistics that we are importing very many products into Australia that could easily be produced here. Every effort should be made to make ourselves as self-supporting as possible, and a

review of the figures taken from the Quarterly Summary of Australian Statistics, December, 1927, indicate some of the things to which it is worth while giving attention. There is one very arresting table. We find that for the first six months of 1927-1928 foodstuffs of animal origin, excluding living animals, valued at £1,554,600, were introduced into the Commonwealth, and foodstuffs of vegetable origin, &c., valued at £3,457,988. That means that approximately £5,000,000 worth of produce was introduced into Australia in six months, a great proportion of which could have been produced in Australia.

Among those items are cocoa and chocolate, coffee and chicory, fruits, dried, including dates, nuts (edible), seeds (canary, hemp, and rape), and tea. These go to make up the commodities imported and that could be produced in Australia.

### **The Need of Effective National Organisation.**

It is my desire to focus the attention of Ministers to the need of some organisation whose duty it would be to deal with all these matters and bring them to the attention of the proper authorities concerned. The Bureau of Scientific and Industrial Research has had under consideration the establishment of an Economics Department along the lines I am suggesting, and if we carry a resolution of this kind here to-day no doubt it will have a very beneficial effect. Such an institution would have a wide range of work in front of it.

Such an organisation is not new. In Great Britain an organisation of a similar character is in existence, and has done very valuable work. The same thing applies to the United States. It seems to me that the time is opportune for an organisation of this kind to be established in Australia, to carry out the work that has been undertaken so successfully in Great Britain and America by similar institutions there.

I have mentioned the fact of the States embarking on schemes of settlement and inducing settlers to take up land suitable to the growth of certain crops without investigation as to the demand for the products to be grown, or their marketing when produced. That indicates something lacking. It would be the function of such a bureau to deal with these matters, to co-ordinate the experience that has been gained in the several States and circulate the information.

### **Making Agriculture Attractive.**

In addition, we have the problem of establishing agriculturists in a manner conducive to making their calling attractive. I believe that agricultural pursuits are the natural avocation of men. It is more conducive to the building up of a sturdy nation or race of people than any other occupation. Anyone can understand that men working under healthy conditions will produce a healthier type than those who are working in an environment less congenial.

### **The Costs of Production.**

At present in Australia farming organisations are continuing to press Governments and endeavouring to educate public opinion as to their rights to secure what they call the costs of production. We receive deputations from these organisations where that question arises, but I have never yet been able to get them pinned down to what they mean by the costs of production, or as to how these costs of production are going to be assessed.

In the course of his opening remarks the Chairman referred to the dairying industry, and said that in Western Australia the average return per dairy cow probably does not exceed 100 lb., whereas the purebred herd of Guernseys at Denmark (Western Australia) are producing 450 lb. Yet you find men engaged in the dairying industry having herds of low production arguing in favour of increased concessions to enable them to enjoy a better standard of living. It is very apparent to anyone interested in the dairying industry that the line of activity should be in the direction of building up the herds as an economic unit in such a way as to secure the maximum return per unit in the herd.

### **Milk Yields Far Too Low.**

In Australia generally the figures for the several States on investigation must show that the yield of commercial butter per dairy cow is far too low. In Queensland the average is 120 lb., and good herds produce considerably more than that. That indicates a line of activity that could be successfully followed to stabilise that

industry and give those engaged in it better returns. It is obvious we must devote our attention to the production of the class of herd that will keep the farmer rather than to the class that the farmer himself has to keep.

### **The Economic Unit in Dairying.**

Then again, having disposed of the first problem, we have to consider what is the economic unit of the herd. By what means can we determine how many in a herd constitutes an economic unit—that is, the unit that a dairyman can look after economically? That is the line of investigation that must be taken up and has been taken up very successfully by the Bureaux to which I have alluded.

### **The Poultry Industry.**

Take, for instance, the poultry industry. The production of eggs and poultry is the fifth most valuable in the United States of America, and the wealth is higher than the yield in many other products which would be considered among the highest produced there. They lay down that the economic flock of fowls is 1,000.

### **What is a Living Area?**

Then we come to land settlement from the economic standpoint. We often use the term "The living area." We understand what is meant by that term, but in an economic sense it is obviously misleading. The living area varies according to climatic conditions, according to the condition of the soil, and for what it is proposed to utilise the land and the markets.

Hon. J. Cain: And very often to a large extent it is also the individual.

Hon. FORGAN SMITH: Yes. That shows the lines we should follow to establish not so much, perhaps, the living area but to establish the living herd, the living flock, and the living volume of produce. We have endeavoured to do that by a very exhaustive investigation into the pastoral industry. Apart from the immediate question of land settlement, this was one of the most valuable economic investigations into the pastoral industry that has been made for the last twenty years. Following on that report we have legislated to provide that in all future land settlement a sufficiency of land will be provided to maintain what is regarded as the economic unit of a flock or herd, or the volume of produce that it will be necessary to give a man a decent standard of living on the variations that take place from time to time.

It will be seen that an economic investigation of these matters I have mentioned would be conducive to greater clarity of thought, and much information would be made available to the various State Departments which would be of incalculable advantage in building up our primary industries.

### **Market Control.**

Then again, there is the question of market control or organisations to prevent fluctuations of prices. These are established in almost every form of industrial activity outside of primary production. Very careful analyses are made as to the consuming capacity of a given commodity. An organisation producing carpenters' saws, for instance, can foretell with a fair degree of accuracy the number required in any one year by the world's markets. The same remark applies to motor-cars, machinery, and so on. It would be the duty of this organisation to investigate marketing conditions, the maximum consumption that is likely to take place, and organise the industry accordingly. In regard to our primary production little or nothing has been done in this direction. The farmer is about the only individual that produces without any foreknowledge of the marketing conditions attaching to his product. As a result you have violent fluctuations in prices in the various markets of the world, both in Australia and elsewhere. During the season when Nature is most bounteous you find a glut in the market, and the farmer gets little or nothing in return for his labour. Under other conditions the market is under-supplied, prices are high, and in many cases only a few people can supply that market. As a consequence the result is bad from the farmers' point of view and from the point of view of the consumer. You have a number of products from which a man can choose, and with orderly marketing you can build up a steady demand for that product, but that demand depends very largely on continuity of supplies. If there is a surplus at one period, and you are unable to supply at another period, the whole market is disorganised; there is no control of prices, and it is detrimental to the interests of all concerned.

### Functions of the Bureau.

The work of an economic bureau would be in the direction of giving assistance in the building-up of marketing organisations which would be conducive to the best interests of all concerned. I suggest that the function of such a bureau would have regard to the following matters:—

Climatic influences; land values; systems of farming practice, mixed farming in contradistinction to single commodity operations; costing of commodity production; finance for production; handling, grading, and packing methods and facilities; transportation; storage; processing; marketing credit; local markets as distinguished from world's markets; the influence of fiscal policies; the relation of the production of a given State to the world's production; problems dealing with the treatment of surpluses, the varying tastes and preferences of consumers; the relative influences of one commodity upon that of another; marketing conditions generally.

It is not my intention to speak at any greater length at this juncture on this matter, but I think I have said enough to indicate what is in my mind and what has caused me to move the resolution now before you.\* Work along the lines I have indicated would tend towards the elimination of waste and towards building up a higher standard of production. Nothing could be more important than that. **High standards of living can only be maintained on the basis of high efficiency in industry, and these are points that can only be established by an investigation along the lines I have indicated.** It would help in the building-up of the primary industries of Australia and increase the general wealth and happiness of the people of the Commonwealth.

\*The full text of Mr. Forgan Smith's motion appears in our abbreviated report of the Conference proceedings in this issue.—Ed.



PLATE 3.—SOME MEMBERS OF THE FIELD STAFF OF THE FRUIT BRANCH,  
DEPARTMENT OF AGRICULTURE AND STOCK.

*Left to Right*—G. Williams (Director of Fruit Culture), J. Stockdale (Brisbane), H. Barnes (South Coast), E. Duffy (North Coast), A. M. Thorburn (Brisbane), H. J. Freeman (Gympie), F. I. Jardine (Nambour), E. Filer (Entomological Branch), S. C. Stephens (Innisfail).



*Photo.: G. H. Parsons.*

PLATE 4.—BRITISH BREEDS OF LIVE STOCK—SHIRE MARE.

A representation of the type aimed at by British breeders (reproduced from "Farming," an English publication).

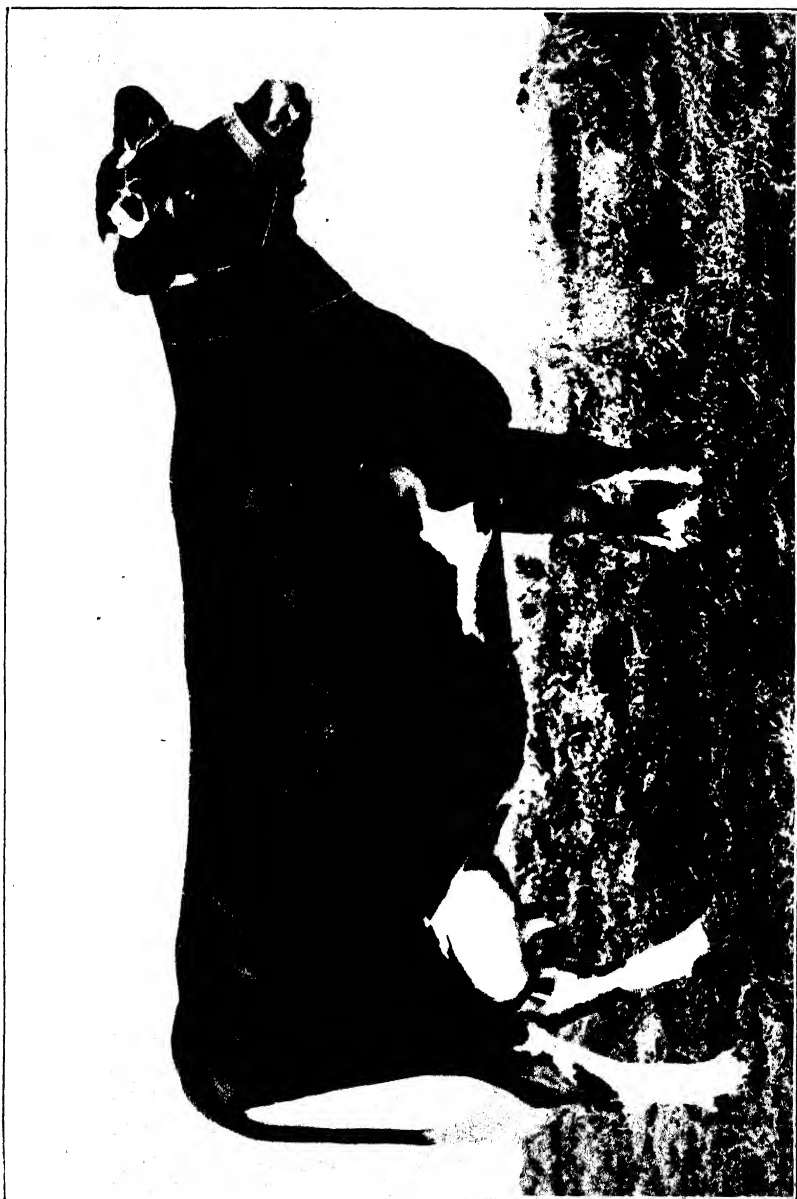


Photo.: "Sport and General."

PLATE 5.—BRITISH BREEDS OF LIVE STOCK—GUERNSEY COW.

A representation of the type aimed at by British breeders (reproduced from "Farming," an English publication).

# PINEAPPLE DISEASE INVESTIGATIONS.

## INTERIM REPORT.

By HENRY TRYON, Plant Pathologist.

### A. INTRODUCTORY.

1. The inquiry in progress serves to support the opinion that pineapples as grown in the open in Queensland are subject to several distinct "troubles," some of which have proved notably harmful and are still so, yet they are, notwithstanding, as vigorous and healthy on the whole as are pineapple plants grown as a field crop in other parts of the world.

2. However, yields of commercial pineapples vary within wide limits, but, as a rule, the differences to be observed are due more especially, not to disease occurrence, but to recognisable factors relating to circumstances and conditions of growth.

3. And among these are certainly controllable ones, constituted by horticultural methods adopted, and that vary in different plantations in every district, with respect, too, to almost all procedures.

4. Economic considerations—as, for example, where the use of pineapple soil fertilisers or drainage is in question—may be the explanation and justification of this variation.

5. More frequently it is want of knowledge regarding the better course to pursue, either arising through absence of authoritative teaching or of the lessons derived from experience.

6. In the subjoined summary of investigations of pathogenic agents that do, however, prove prejudicial to successful pineapple growing, a consideration of the extent to which these may operate in the several districts of the State where this occurs has been for the present postponed.

7. This has been due to the fact that visits to plantations in detail throughout the area have not been generally prosecuted, since the necessary adequate thorough personal inspection would have involved much time and labour that would have been incompatible with the often tedious and protracted minute examination of disease-affected pineapple material in the laboratory—so essential to our preliminary pioneer undertaking. Moreover, protracted drought succeeded by much rainfall would have operated to render a disease survey inconclusive in yielding material results, when it might in their absence have been otherwise.

8. To overcome this conflict of duties and reduce the effect of stressing the importance of one, our original scheme contemplated the active co-operation of another Bureau of the Department having several district field officers on its staff in order to discover the local occurrence of pineapple diseases of whatsoever description and their local range.

9. The foregoing explanation why an extended pineapple disease occurrence survey has not so far been undertaken throughout the Cooktown-Tweed River coastal area may be applied also to the lack of field experimentation devised by us, and carried out under our direction, for the purpose of advancing and checking conclusions the outcome of technical research prosecuted; but, too, as a guide in devising procedures at large in both preventing and controlling the pineapple troubles with which this research has been concerned.

10. But in the case of the several pineapple maladies of a non-parasitic nature primarily—physiological pineapple maladies—field experimentation from this point of view is very needful, even, moreover, to throw light on the nature of the circumstances giving rise both to their presence and destructive energy.

11. Most if not all of Queensland's pineapple diseases or virtual diseases are apparently common to the State and other pineapple-growing countries (the conclusion of both testimony and of personal observation). However, in reference to some of them elsewhere—notwithstanding successive investigators for years past have been inquiring into them from their several points of view—unanimity as to their causation has still to be reached, whilst as regards others our own findings (we may be excused in mentioning) have assisted in promoting this; a remark that applies to pineapple wilt on the one hand and to pineapple brown fruit rot on the other.

12. As an incident too frequently realised, bearing both in the wider occurrence and active perniciousness of pineapple maladies in the State, our inquiry (so far undertaken) has served to compel us to dwell upon the fact of the very prevalent

creation of new pineapple disease areas, by (1) the use of already infected stock in planting and by (2) devoting to pineapple cultivation land already tainted with a malady derived from another crop plant, and common to the pineapple. Nematode Root Gall of, say, the banana, &c., and a root disease of sugar-cane may both be mentioned in this latter connection. The interplanting of other economic plants with pineapples may, as we have noted, conduce to the same injurious results.

13. Pineapple diseases and pineapple injurious insects often constitute different aspects of a common trouble, and thus the latter have not escaped our attention.

14. A comprehensive pineapple memoir exclusively devoted to diseases and injurious insects is in process of preparation, but its completion must be deferred until our detail inquiry has been further prosecuted and certain outstanding questions have been settled.

A series of educational addresses in the several pineapple districts of the State are also projected when the progress of our inquiry will admit of it, and when a disease-occurrence survey has revealed those pineapple maladies that are present where such an undertaking is called for and in order to give point to whatever information it is sought to convey.

## B.—NOTES ON THE NATURAL ENEMIES AND DISEASES OF PINEAPPLES.

### 1. AGENCIES—HARMFUL GENERALLY.

#### 1. Top Rot—Root Disease.

This pineapple malady is characterised by the death of the central leaf-shoot of the plant (whence should arise the flower and fruit) in the early course of the trouble, the apical growth undergoing a form of wet decay. This, as we have discovered, is due to an injury of the extreme root ends also following damage in the first place to the absorbent root hairs occurring here. It arises from the development of an irritant in the soil itself, whilst the initial injury mentioned gives rise to and is augmented by a soil-frequenting fungus that, invading the root tissue, gradually also destroys it. Top Rot of the pineapple plant is very destructive where it occurs, but is neither necessarily hereditary in the plant nor necessarily infectious. Our observations have shown that it becomes manifest only in locations in plantations of a special character in which drainage is held back by retentive subsoil or by depressions therein at a low depth from the surface, or if of more profound occurrence connected therewith by a soil (fine sand for example) that admits of its upward movement by capillarity therefrom, whilst the chemical irritant itself is provided by the unacrated soil through which the drainage has percolated. This disease closely resembles that of a sugar-cane disease that we have described under the name of Top Rot also. In the Hawaiian Islands, a pineapple disease, referred to under the term Pineapple Wilt, and as being the most formidable trouble encountered in plantations there, has, in the light of our description of the malady under notice, been regarded by L. D. Larsen as identical with it; but the question involved is one that we are not ourselves prepared to decide. Top Rot, that may be very prevalent in certain places in Queensland but usually occurs quite locally and in circumscribed areas, can, as we have seen, be prevented occurring by cultural procedures, and the avoidance of uncongenial sites in pineapple growing.

#### 2. Base Rot.

In this pineapple trouble, the individual leaves are successively involved from the base of the plant upwards, younger and still younger ones being gradually the scene of the morbid changes that characterise it. The affected leaf, or leaf-portion, firstly develops a *yellowish-green* colour that contrasts with those still unaffected that may exhibit a *vivid-green* colour. Then it dies from the tip towards its base until it is affected in its entirety. At first, the part destroyed becomes grayish-brown and flaccid, the demarcation between it and the still sound portion being marked. Usually, except in quite young plants (suckers), the death of the pineapple is only very slowly realised; but it soon ceases to thrive and remains without evidence of prospective fruit production. The malady is also now responsible for many of the "misses" met with in newly established pineapple plantations, or new areas devoted to the plant therein, and especially in replanted blocks. We have found Base Rot manifesting itself sporadically in plantations usually, although not seldom being responsible for noteworthy damage in the aggregate. Also, that it is due to a special form of decay that commences in the broken tissue occurring at the spot in the sucker that marks where it has been detached from its parent; or starts in the abortive pineapple at the base of a "gill sprout"; and, too, that a very small area involved in decay here may effect trouble.

It has been discovered that this Base Rot may be prevented by exposing suckers intended for use as plants for some days so as to admit of their ends drying out; and in the case of gill sprouts by first detaching the swollen basal portions or miniature pines from which they arise before doing this. Dipping, too, the broken or cut ends in a fungicide, will afford also a further safeguard. Again, planting in soil still saturated with moisture conduces to Base Rot, and should be avoided. Further, during moist muggy weather this trouble may develop in suckers that are left in heaps, or are being trucked, in both cases whilst in a damp sappy condition, and that in such circumstances the Base Rot may become manifest within a week or two of planting them.

The inquiries have suggested that our pineapple Base Rot is identical with the pineapple Blight of Florida.

### 3. Chlorosis ; or Leaf Pallor.

This, again, is a constitutional trouble that, as we have discovered, is in some situations fraught with serious damage to the plantations. In this there is until lately, and unlike what occurs in "Top Rot" and "Base Rot," no decay of the stock internally taking place. The entire plant presents a sickly appearance, being of a general palish hue of colour. The first leaves to be affected are the outer—the older ones. Thus, whilst the inner leaves of the central shoot may be merely clouded with creamy yellow, the outer ones external to it may be almost white instead of green, with the central broad purple band changed to red and often almost lost. These changes, however, may occur in pineapple plants that previously have shown normal growth, but with their manifestations this is brought to a standstill. Following these symptoms of sickness, a wet form of decay may set in, involving the older leaves—now horizontal on the ground—where they are attached to the stem, the stem itself in this situation, if not earlier, and so in turn the roots. This decayed tissue supports a white filmy growth of fungus. The trouble, however, is not due to the attacks of any such organism acting as a parasite. On the other hand it is an indication of the effect on the plant of soil that has become saturated with surface drainage, and which may persist when this soil only holds sufficient moisture to ball when compressed in one's hand.

The lay of the land, with regard to a plantation or any part of it, will indicate where this pineapple chlorosis is likely to take place, and where the preventive measure of proper drainage should be undertaken.

All authorities on pineapple growing emphasise the necessity of "proper provision for suitable drainage," and disregard of this requirement has even been mentioned as one of the causes responsible for continuously diminishing yields in fruit production.

### 4. Root Tangle.

This, although not a disease proper, has been observed to considerably affect returns from all crops, subsequent to the plant crop, and even so its prejudicial effects have been noticeable, especially in the late dry season. It arises through the inability of the roots that start from the root granules, occurring on the plant at the base of each sucker, and beneath the leaf-sheaths here, to reach the soil, owing to these leaf sheaths failing to decay and break down, and so admit of their emission, whereupon they become confined to the narrow spaces between leaf bases and stem, and so as they grow pursue an irregular winding course often side by side but with more or less interlocking.

This condition is commonly realised when suckers have not had their basal leaves removed in sufficient numbers prior to planting, or when they have been planted in the flat, so that when rain falls the surface soil surrounding these suckers is too dry to admit of the leaf-sheaths naturally decaying under the influence of saprophytic organisms, as they continuously do when it is moist. It is to be observed also that the use of butts, in so much as they result in the suckers arising from them, being higher (set) in the ground than if independently planted, is again very conducive to root tangle. In crops again beyond the plant crop, the suckers that yield this are succeeded by others that spring laterally from the stem as it branches monopodially, each becoming a stem in turn giving rise to a sucker since it ends its growth in fruit production. Thus successive suckers start higher and higher from the ground, and thus even the first produced is often unable to send roots to the earth by decay of its lower leaf, unless special means are taken to ensure this. This tangle in fact militates against the functioning of any roots except those originally entering the soil shortly after planting.

This circumstance may be overcome by forcing the branches of the plant towards the ground, or bringing the earth upwards towards them, as by turning the land towards the plants in ploughing rather than away.

### 5. Wilt.

Two apparently distinct pineapple affections have been brought under notice with the title "Pineapple Wilt" assigned to them. Both may be exhibited by younger or older plants.

(a) In one the pineapple plant (sucker) after growing perfectly erect for a time gradually curves over, the older leaves being directed in this movement more or less regularly to the side to which this takes place. This foliage presents also an unusual vivid green, except outwardly where it may be more or less clouded with yellow. Each leaf, again, is shortened coming more suddenly to a point and has its margin curving upwards and inwards (involute), so that it appears widened at its base; it is, moreover, unusually turgid and brittle. The entire plant, moreover, has a stunted habit and commonly yields no fruit. Nematode Galls or Mealy Bugs have been found on the roots of affected plants, but the general symptoms evinced are not characteristic of their presence; in fact, both may be absent. Such plants may occur sporadically in good more or less level land.

(b) In this form the stem also gradually inclines over until eventually it may be almost parallel with the soil surface. There is, too, a general pallor of the foliage, and both it and the stem lose their turgidity. Meanwhile the individual leaves become light-coloured, sometimes indeed of a cream-like hue. Then first the lower leaves and then the stem where they originate will both rot and decay. (This may in part be due to sun scald experienced by the plant when horizontally inclined.) This form of "wilt" also affects pineapple plants varying in age, and usually when occurring neither fruit nor flower is produced. In those plants having "wilt" examined, the roots were intact and apparently healthy. This latter form of the trouble usually is met with in poorer soil than the former, and may locally occasion much injury and loss to a plantation.

At present we are unable to state definitely with respect to either form what agency may occasion it, but, although in some respects it corresponds to the pineapple "wilt" of the Hawaiian Islands, that during 1910-19 had no less than five distinct causes assigned to it by as many investigators, it is evidently distinct.

### 6. Club Root or Root Rot—*Heterodera radicola* (Nematodes).

This, in brief, causes first swellings and then decay of the root-ends, the nutritive absorptive portion, and so gradually determining arrested growth, then virtual starvation of the plant. A most serious pineapple malady is Root Knot, yet one whose nature and cause are both usually overlooked. This we have discovered is widely prevalent, extending gradually its range of occurrence, doing much damage, and, as far as is at present known, almost impracticable to deal with here from the point of view of farm economies in ordinary plantation routine. Its injuries to the plant being usually of an indirect nature, it is commonly spoken of under one term or another that is descriptive of some plant malady distinct from it. It has been found that it is being introduced on to "clean land" through the use of pineapple plant stock, "butts" especially, that are already nematode infected; and thus also with other plants harbouring the disease—tomato seedlings especially grown as inter-crops. But pineapples are commonly infected through growing them in succession on land on which other plant crops have manifested the trouble—e.g., bananas, sugar-cane, potatoes, &c. This is due to the commonly unrecognised fact that the parasite of Root Knot—the nematode worm, *Heterodera radicola*—leaves its temporary host-plant habitually to pass into the soil and thence enters into the roots of other plants susceptible to its attacks. The coping with this form of Root Knot is one of the problems of horticulture and agriculture generally throughout the world, and is being assailed here and elsewhere only by an empirical method of attack; better procedures have yet to be discovered than the costly ones already in vogue.

### 7. White Soil—Fungus.

The pineapple plant, under the influence apparently of this organism, ceases to thrive, and presents a starved appearance (as does a plant when, say, hanging for some time on a fence) being now of a sickly yellow instead of a vivid green colour. Small patches of plants or individual ones in a plantation may be noticed thus affected. This plant, again, when removed from the ground exhibits

a more or less conspicuous development of white fungus mycelium beneath and between the leaf sheaths covering the base of the stem, and in later stages a rotten condition of the corn develops, the affected tissue eventually becoming dry and powdery. Again, the roots may have white threads coursing over their surfaces; but in some instances the latter (now very slender indeed) may be observed throughout the soil in which the dead or dying roots occur and to a slight extent adherent also to the latter.

This trouble is still under observation, and the final or reproductive form of the fungus apparently implicated has yet to be discovered. Apparently, two different fungi may produce the effects noticed. It reminds one of a well-known sugar-cane disease, in which a small agaric (a species of *Armillaria*) is concerned.

Its presence is evidently favoured by the use of "butts" in planting, rather than suckers, nibs, or crowns, those portions of the stem supporting a growth of fungus is very similar to that associated with the sick plants. Further investigation is projected.

### 8. Soil.

Abundance of evidence is forthcoming to indicate that pineapple plants or even entire pineapple plantations in Southern Queensland are in some cases being prejudicially affected, from the point of view of fruit production especially, by defects in the soil constituency commonly but not always to be overcome by the addition to it of manurial agents suggested by the plant's chemical composition. The pineapple, as has been shown by others, makes special demands not yet perfectly ascertained in the way of essential nutrients for crop production—ones not always met by even apparently "good ground," or by the addition of what "poor land" obviously lacks to make it so.

In many places the soils devoted to pineapple plants—as is suggested by the appearance of the latter—would doubtless be benefited by incorporation of vegetable matter to supply the necessary humus; but at the same time, their roots being intolerant of acidity in the soil, this would have to be supplied in a manner to avoid the presence of an excess of acid that vegetable matter might yield.

Already the lower soils of one area have been found to be slightly acid, and appearances of pineapple plants grown therein suggest that in some few instances this fact is reflected in the state of health of the plants.

Although the physiological trouble named "Chlorosis" has been commonly remarked, this is not the form of it manifested by pineapples elsewhere, due on the one hand to excess of manganese (Ohan) and the other to the presence of lime in undue amount (W. Indies).

### 9. Bottle Neck.

The name Bottle Neck is that of a pineapple fruit malformation suggested by the shape assuming the form of a bottle, being narrowed suddenly towards the apex or top that remains small and neck-like and widens basally to represent the body. Usually, too, if the fruit reaches maturity it is of relative small size. Growers associate "Bottle Neck" also with special features, evinced by the prospective fruit, even prior to flowering having taken place—a persistently diminutive flowering head (pine) with scarcely any top, and it of somewhat scale-like bracts, and surrounding this the leaves ill-developed and with their margins turned in on the upper surface (involute), and therefore appearing though narrowed, noticeably so. And, further combined with this, an undue amount of yellow spotting and mottling of the older or lower foliage.

Subjected to these unusual conditions, that may be quite prevalent on certain plantations, the yield in fruit to which this applies may be greatly reduced, and insomuch also as growth may be brought to a standstill or nearly so, it is often that affected pineapple plants have to be eradicated.

The latter constitutional symptoms are not uncommonly met with in pineapple plants whose roots are rendered functionless and partly destroyed by either gall-forming nematodes or by Mealy Bugs, also plants growing in land where Bottle Neck in the fruit occurs; so also, with respect to land that is prone to dry out whenever a drought is being experienced. Still there appears to be another causal agency that may determine in some unascertained quality of the soil, apart from that which may conduce to desiccation in dry times, also acting through the root system. (The local distribution of occurrence of Bottle Neck suggests this.)

This, and the association of other diseases with pineapple plants that are alleged to be subjects of Bottle Neck of the fruit, is in harmony with the fact that this malformation is evidently the expression of some factor operating continuously for a period, at a particular time during the development of the fruit, so as to check and even restrain its growth. This critical time is when its apical development—the last to take place in the fruit—is being undergone, so also, when parts other than fruit participate at other times in the pineapple plant's history of growth.

[The occurrence and prejudicial effect of Nematode worms as well as of Mealy Bugs is one for separate consideration.]

The question of the influence of the soil—the occurrence of a special soil type—from a physical and chemical standpoint, needs the co-operation of the chemist and the controlling influence of field experiment.

As may be inferred from the foregoing findings, Bottle Neck—as is evident from facts brought to light—is not a permanent endowment of the pineapple plant. However, it is injudicious to utilise stock from affected areas for planting unless the certainty that it harbours neither Mealy Bug or Nematode Gall is assured.

## II.—AGENCIES INJURING THE FRUIT.

### 1. Fruitlet Core Rot (Tryon), Brown Rot (Larsen), Black Spot, &c.

The fruit disease known under the above names is, as we have found, very prevalent in South Queensland, during the winter season affecting the "winter crop." It is said, indeed, when pronounced then to involve locally at least 25 per cent. of the fruit, both smooth and rough leaf pineapple varieties being alike subject to it.

It has been termed "Fruitlet Core Rot" by us its discoverer, since it is at first confined to single "pits" of the fruit, and the dark spots just within the outer surface, so evident on cutting the pine across, and so symptomatic of its presence have originated its more popular local name, "Brown Rot," above mentioned, in the Hawaiian Islands where also it is met with, so also we have the term "Black Spot," although the tissue first involved is dark-brown rather than this colour. From single pits it may extend to others, especially when the more succulent fruits of the smooth-leaf pine, for example, are attacked. At its commencement it may occur without external symptoms being noticeable. It has been shown by the writer to originate in a very minute injury at the base of the closed calyx cavity or cup (air-chamber of some) and near in it where the pistil is planted. This injury, in the rough-leaf pine at least, is caused by the punctures of a tiny mite of invisible smallness—except when a magnifier is used—an acarid that we have assigned to the genus "Tarsonymus." At times, however, and more commonly in smooth-leaf pines, the injury consists of a few more or less gaping fissures in the same position as these punctures, caused by the inability of the thin hard tissue here to resist weather changes—from high to low temperature and vice versa—having a disruptive action when as in winter surface extension cannot as here at the same time ensue to withstand it. In each case fungus infection is rendered practicable and takes place at these sites, and is especially operative in causing tissue changes in colouration and decay, through excessive realisation, since the relatively cold winter temperatures in reducing vigour deter the plant in resisting and overcoming the attack of the fungus and the changes that it can effect.

This explanation has been virtually accepted by Larsen as an explanation of Brown Rot in pineapples in the Hawaiian Islands and by Matz as far as relates to Porto Rico (W.I.) with this difference, that whereas the writer regards the fungus implicated as derived from the dead and decayed stamens constantly present within the closed calyx cup, these writers regard the micro-organism as being a *Fusarium* of undetermined species and origin. The fact that this trouble both originates and develops always in a closer space—the calyx-cup in the individual fruitlet or pit—renders direct treatment apparently wholly impracticable. Dusting the flowers with very finely-ground sulphur has not been attended with certain benefit either in the case of the Ripley Queen, or with the common rough-leaf pine. Inquiry is being prosecuted with a view to ascertain to what extent, if any, this fruit disease is virtually hereditary, since the mite mentioned is indigenous to the plant. The circumstance that the trouble is locally prevalent in certain plantations is suggestive, indeed, of locally-grown plants constantly carrying with them the prime agent of this Fruitlet Core Rot.

## 2. Sun Scald.

The symptoms of sun scald of the pineapple fruit are as follows:—At first one face of it is of a lighter green than is the surface generally and then assumes a pale-yellow hue. A softening and collapse in patches now develops in this area, whilst meanwhile there is slight exudation of sap and later on fissuring—these appearances being suggestive of premature ripening restricted in position and extent to the part in question. These may supervene a change from yellow to dark-brown and following this a drying out shrinkage inwards of the affected tissues—the alteration of colour, significant of decay proceeding deeper and deeper, the conspicuous altered tissue being very noticeable on cutting the pine across. (Note.—These progressive changes are detailed since they are usually regarded as symptomatic of a specific disease.)

At first there is no occurrence present of micro-fungi to suggest parasitism as the underlying cause of this trouble, but the presence of morbid moist plant-tissue soon determines the presence of the Brown Rot organism whose destructive activities are promoted by Fermentation Flies (*Drosophila*) that are early attracted by it. Pineapple Fruit Scald with corresponding features is met with also in other countries; and it may be prevented when threatening here as in them by sheltering each individual pine when its attitude acquired during growth suggests it by the use of some light plant debris or cotton, or by raising them under shelter as in Florida, treating the pinery as a whole (a procedure not admissible, possibly, on economic grounds in Queensland, except under special circumstances).

Pines that have been rendered unduly succulent by generous rainfall, or by free use of growth-conducting fertilisers, and thus whilst producing large fruit have not the rigidity so essential for maintaining them in an erect position, are liable to this injury, since leaning over they expose to the sun's rays one face rather than the surface generally. This especially applies to the first or plant crop, but the fruit of succeeding ones are also liable to become oblique since, arising laterally on the plant, the inclination under the circumstances mentioned will be emphasised with age—the bias once produced naturally augmenting.

Fruit affected by sun scald even in a slight degree on being gathered is very liable to travel badly, since the damage once initiated is liable to develop with the ripening process.

## 3. Cripples.

In this further fruit malformation the symmetry of the fruit is impaired, one side through being invested in growth being flattened or even concave, the pits included in the affected area being relatively small. This in the past especially affected pineapples in the localities longest devoted to pineapple growing (Old Nudgee Gardens), and the pineapple variety earliest cultivated, the so-called "rough leaf"—the smooth-leaf pine (Cayenne) manifesting Fruit Cripple much less frequently. It has been pronounced to be an hereditary trouble transmitted by vegetative growth from affected plants. Also, that it is linked with the presence of a "mesial streak in the leaves." We are not in a position to support either of these conclusions unless on *a priori* grounds. At present the occurrence of these fruit cripples is not a serious matter with regard to pineapple growing, but it is one that may claim attention at our hands in view of this being not so in the future.

## 4. Fruit Storage Rots.

These are an important consideration since not only do they impair the value of shipments especially overseas, being responsible for a large measure of destruction at times, but they may also affect the value of the pack when ripe fruit is used by canners. Any fruit that is bruised is especially liable to the destructive action of the agents that cause them.

We have not so far been able to prosecute the inquiry necessary for the elucidation of this matter, beyond having discovered that a special species of *Penicillium* (one of the mould-fungi) may be implicated in this work following up the damage arising from mechanical injuries, bruising, &c. It is in this work, that of storage Pineapple Rot, that the organism of "Soft Rot" (*Thielaviopsis paradoxa*) plays such an important part elsewhere.

## 5. Soft Rot (*Thielaviopsis paradoxa*) (de Seynes), von Hohnel).

The occurrence here of Soft Rot has not definitely been established, but owing to its prevalence in other countries where pineapples are grown as a field crop (e.g., Hawaiian Islands, the West Indies, and Florida) may be expected to already be present in Queensland also. When the fruit disease, originally termed by us "Fruitlet

Core Rot," and subsequently by others Brown Rot, freely affects the smooth-leaf pine it may readily be confounded with it owing to the development of so much dark-brown tissue adjacent to the external surface. It is essentially a disease affecting the ripe fruitlet, generally on its being stored and especially when shipped. In the field should ripe fruit occur, the organism causing it finds entrance through insect punctures or mechanical injuries; in the fruit-store through the cut-end or stem (Base Rot); and on ship board—when the atmosphere is humid—through the general surface (shipping rot). When the fruit is affected, "the tissue takes on a water-soaked appearance, becomes a shade darker yellow than the normal tissue, and has a characteristic odour" (L. D. Larsen)—that of acetic-ether. When exposed to the air, such affected tissue after the lapse of twenty-four hours has become black owing to the formation of innumerable black spores on the surface by the *Thielaviopsis paradoxa* parasite. This may also happen within the core of the fruit when the Soft Rot has proceeded from the base upwards through its centre.

(This Note is inserted for convenient reference.)

## 6. Watery Core.

Some years since (1918) an anomalous pineapple fruit disease was brought under notice as affecting a locally slowly-growing winter crop on land that had been neglected. The features noticed were as follows:—The core becomes watery and soft; and thereupon this change extends outwards to the surface. The fruits when attacked are partially ripe, but still green on one side. In other respects they are well developed and sound.

This if still now discoverable awaits investigation.

## III.—INJURIOUS INSECTS.

### 1. Root-destroying Beetle Larvæ (*Scarabaeidae*).

These principally prove injurious in pineapple plantations in the southern parts of the State, and especially in special positions (e.g., higher grounds) and special soils ("heavier" ones) within these. The insects are the larvæ of an undescribed species (a large-size one) of *Lepidiota*—a member of the Scarabæid group Melonthidae, the genus that embraces more than one sugar-cane destroying beetle also. The injury they occasion is the destruction of the entire root system by gnawing off usually short one root after another, but they also gouge out cavities in the root stock itself, single grubs passing through the soil from one plant to another in the row. These destructive grubs have at least two years in the soil, and as they meanwhile persist, generally speaking, in one spot, the continuous damage they perpetrate is considerable. Moreover, since they may pass downwards with the moisture level as the soil surface dries out during drought, their presence may be overlooked and so same individual grubs may destroy successive pineapple plantings. They have been found to yield to the methods applied in subduing sugar-cane destroying *Lepidiota* grubs, although these are not all available, since the pineapple destroying beetle (the parent of the root-destroying grub) does not apparently feed on the foliage of trees or of other plants, and remain on them during the day as do so many of the "cane beetles," and thus they can neither be captured or poisoned as could be done were this habit displayed. On the other hand, they pass the hours of the day beneath the soil to which they repair, only issuing from it as at first—at and just after sunset (during September-October) to swarm and mate when temporarily settled. It has, however, been practicable to capture a proportion of these beetles on emergence since they will remain temporarily settled on any small bushes that may be stuck in the soil whence they are issuing and so may be hand-captured. The destruction of the large grubs in the soil by paradichlorbenzol has been found practicable. The necessary inquiry centering on this destructive insect and its habits is in progress.

*Note*.—A second, a larger species, of *Lepidiota* of unknown feeding habits occurs in a portion of the district in which this pineapple damaging one is met with. In Southern Queensland a third scarabæid larvæ also gnaws pineapple roots, but not shortly off—possibly *Isodon puncticollis*.

### 2. "Mealy Bug" or "White Louse" (*Coccida-Pseudococcus* spp.).

What are apparently two different kinds of "Mealy Bugs" have been found associated with pineapple plants. One, occurring especially upon and injuring the root system—and in feeding amongst other places—by suction at the root-ends causing an obscure form of plant failure through preventing their proper functioning—damaging the nutrient-absorbing tissue occurring there, and very harmful when

dry conditions prevail and fresh root-formation is no longer taking place. The other Mealy Bug concentrating its attention principally on the apical growths above ground on either the developing pine or tender leaf-shoot, but infesting the base of older and more developed fruits also. This latter, as we find, is especially harmful in the more northern areas of this State, where its work is facilitated by a special ant, that in return for sweet aliment that it derives from the pineapple-loving insect, protects it from its would-be enemies with a canopy of debris or some other vegetable matter.

The species of *Pseudococcus* concerned have not yet been definitely specifically determined, but two different species of Mealy Bugs are known to attack the pineapple in other countries.

These harmful insects, whose obscure habits lead generally to the damage they perpetrate being overlooked, are, it has been discovered, largely disseminated and so established in clean areas by means of plants used in propagation that already harbour them. This remark, whilst it may refer to both suckers and "nibs," has special reference to "stumps" that are often grossly infested. Any plants that show the merest trace of Mealy Bug presence should be disinfected prior to being sent out or planted. Fumigation for scale insects will constitute an effective method in securing this end if carefully pursued. Experiments involving the use of hot water are projected.

### 3. The Pineapple Scale Insect (*Coccidae-Diaspis Bromeliaceae*).

This formerly was to be met with in the Brisbane area infesting plants of the pineapple family (*Bromeliaceae*). Fortunately, it apparently has spontaneously disappeared. In the West Indies and Florida it is one of the plant's worst insect enemies.

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## THE LARGE FRUITED GRANADILLA.

G. WILLIAMS, Director of Fruit Culture.

The Passiflora family is of wide distribution, several being included in our native flora, but to the introduced varieties we are indebted for their delicious fruits. The passion fruits, of which two are of purple and one yellow, are widely distributed. A recent introduction, *P. ligularis*, has not been sufficiently established to warrant general comment. The fruit is comparatively small—though the foliage more resembles the granadilla—and is of plum colour. *P. laurifolia* is an old identity, but extremely rare. The fruit is very sparsely produced, but the quantity may be increased by hand pollination. It is twice the size of the large purple variety, which it excels in flavour. Recently a fair supply of granadillas, *P. quadrangularis*, has been available on the local markets, but distant transport obviously necessitates their being forwarded in a rather green stage, consequently the flavour is not in many instances fully developed. It is extremely rare that the large-fruited granadilla, *P. macrocarpa*, is seen on the market, though vines are occasionally noted in private gardens. The more fertile soils in some of the higher parts of the metropolitan area are adapted for the production of this highly esteemed fruit. The illustration is of a fruiting vine in Mr. J. C. Brännich's garden at Taringa, near Brisbane.

The vine may be induced to climb over a trellis but in this way is unsatisfactory, the best results being obtained when grown over a pergola, as shown, covered with open (5-inch) wire netting, or any substantial structure with widely spaced battens. It is found without hand pollination the early flowers fail to set fruit, but later in the season a good crop is carried. In addition to its use as a dessert the granadilla of both types, when properly matured, is prized for culinary purposes, when its succulent pulp protected by a very thin skin is incorporated. The fermented juice of the fruit may be converted into a most palatable wine.

Plants are propagated from seeds or cuttings—planted in early spring. Germination of seeds is accelerated by soaking in hot water for three or four hours before planting. Seedlings will transplant readily, provided the foliage and soft terminals are removed; usually they are pot grown when removal of any portion at the time of transference to open ground is unnecessary.



PLATE 6.—THE LARGE-FRUITED GRANADILLA.

Carrying specimens 9 in. x 17 in. circumference, grown by Mr. J. C. Brümich, in his garden at Stanley Terrace, Taringa, near Brisbane.

## THE LATE MAJOR A. J. BOYD.

Many expressions of regret at the passing hence of Major A. J. Boyd, F.R.G.S., who was editor of this Journal from 1897 until his retirement in 1921, have been received, together with many evidences of widespread appreciation of his worth and work. Included among them were the following Press references:—

From the Sydney "Bulletin," 23rd May, 1928:—

Major A. J. Boyd, man of many parts and fine personality, passed over in Sydney last week at eighty-six. Born in Paris, he came to Australia, after a spell at sea, in 1860, and became one of the early sugar-planters of the Northern State. From that he passed into the Education Department, and later conducted a school of his own which turned out many first-class men. A ripe scholar and an exceptional linguist, he also broke into journalism; he edited the "Queensland Agricultural Journal" from 1897 till he retired in 1921. He was a keen volunteer soldier in pre-Federation days, and held his majority in the old Queensland Garrison Artillery.

From "The Brisbane Courier," 16th June, 1928:—

I was most interested (writes a correspondent) in the article entitled, "The Late A. J. Boyd, Soldier, Sailor, Schoolmaster, and Journalist," written by "Nut Quad." In it the writer remarked that the late Major Boyd was a Frenchman born—and it reminded me that sometimes people had jokingly accused him of being half a Frenchman, because his parents happened to be stationed in France at the time of his birth. His reply was, "If I had happened to be born in a stable would I have been a horse, or, if I had been born in China, would I have been half a Chinaman?" It would have been very hard to find a man who was prouder than he of being British.

In mentioning that the Darling Downs Mounted Infantry was largely the fruit of the late major's recruiting zeal, "Nut Quad" reminded me, too, of the Eton Cadets at his Nundah School, a corps of which he was very proud. All his friends will remember his enthusiasm for soldiering, and those in close contact with him were apt to catch his enthusiasms. Mr. Orlando Daly, a tutor at Eton, Nundah, passed on from that school to the Permanent Force in Brisbane, and so did Mr. J. J. Byron (another tutor at Eton, Nundah), now Major-General Byron (of South Africa). The late Major was very proud of the fact that three of his lieutenants in the Brisbane Garrison Battery when he was in command all became distinguished soldiers, namely, the late Major-General Sellheim, General Foott (our Queensland Commandant), and also General Coxen. General Sir Brudenell White—[a Queenslander and one of the greatest general staff officers the war produced—Ed. "Q.A.J." ]—was a pupil at Nundah, and later on received some coaching from the late Major Boyd for his military career. Others of his pupils included Mr. Justice Lukin, the late Mr. Charles Bright (Postmaster-General), Mr. A. D. Walsh, the late Mr. Gordon Graham (Under Secretary for Lands), Mr. Horace MacPherson, Sir Samuel Pethbridge, K.C.M.G., and others too numerous to mention.

When "Nut Quad" gave a list of the late Major's writings, he forgot to mention the author's book, "The Shellback," in which he gave an account of his life at sea in the 'sixties—and it was to those far-off days that his mind mostly went back in the last few years of his life. These few reminiscences are written by one who knew him very well as soldier, sailor, schoolmaster, journalist, and also a very dear old man. [Major Boyd's literary activities covered a very wide field. In addition to the works already listed, he was the author of "The Colonel's Sons" and other stirring boys' stories. "Geology in Verse," a clever text-book in rhyme, and numerous pamphlets and brochures on agricultural subjects were also the products of his vigorous pen. His general outlook on world affairs was that of a broad-minded, keen-brained, cultured Australian.—Ed. "Q.A.J." ]

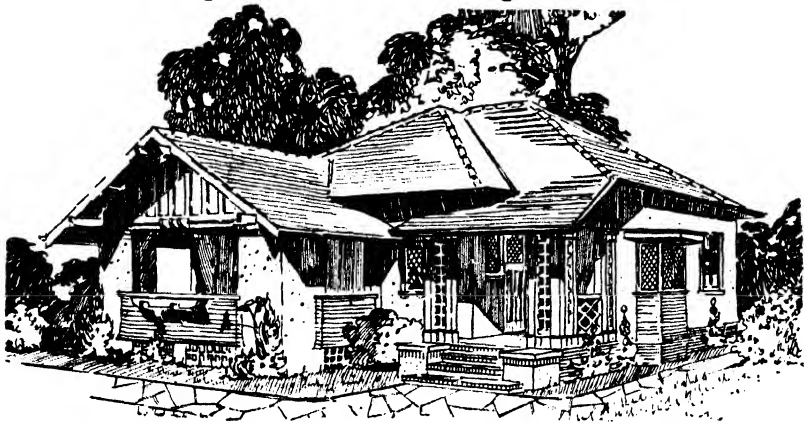
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## MANURING OF BANANAS.

In the May issue of the "Journal" the usual formulae for fertilising of bananas were given, and recommending the use of sulphate of potash as a source of the necessary potash, which is of such importance for successful banana culture. Bananas are one of the plants which like a certain amount of chlorine, and the use of salt is therefore frequently beneficial. By substituting the cheaper muriate of potash for the sulphate the banana crop will be greatly benefited, and muriate of potash can therefore be strongly recommended as a base for all fertiliser mixtures for bananas.

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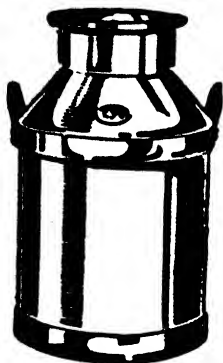
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## OBSERVATIONS ON EYE WORMS OF BIRDS.

By J. W. FIELDING, Australian Institute of Tropical Medicine,  
Townsville, North Queensland.

THE presence of worms in the eyes of birds was apparently first noted about 1819, when Rudolphi described a number of species. From 1825 onwards a noted collector named Natterer appears to have concentrated his attention on the parasites of birds, paying special attention to the parasites of the eyes. He appears to be responsible for quite half the species recorded to date, which were collected principally in Brazil. They were described by Molin (1860), since when various authors have found and described new species from other parts of the world.

Kreffft (1871) first recorded the presence of worms from the eyes of wild birds from the Australian region. These worms were placed in the genus *Ascaris* (*Ascaris* sp.), and were recovered from the Red-wattle bird or Gill bird, *Acanthochara carunculata* Lath. Johnston (1912) redescribed it as *Ceratospira acanthocharæ*, later placing it in the genus *Oxyspirura*; Railliet, Stiles, and Hassall give the specific name as *Anthocharæ*. Von Einstow (1897) found worms in the eyes of Brenchley's Fruit Pigeon, *Zonocnas brenchleyi*, from Bismarek Archipelago, describing it as *Ancyracanthus ophthalmica*; Ransom (1904) brought it into the genus *Ceratospira*.

From 1913 onward special attention has been paid to the presence of worm parasites in the eyes of wild birds in North Queensland. Nicoll (1914) recorded parasites from the eyes of the Wedge-tail eagle, *Uroætus* (*Aquila*) *audax*, and the Brown hawk, *Hieracidea berigora*, which were placed provisionally in the genus *Oxyspirura*. Breinl (1913) recorded *Filaria dacteloni* from the Laughing Jackass; *Dacelo leachi*, which was placed by Johnston (1916) in *Ceratospira*; and latterly this species has been placed in the genus *Thelazia* by York and Mapleston (1926). The presence of an *Oxyspirura* sp. from the Sea Eagle, *Halietus leucogaster* is here recorded. These records form the positive findings of a systematic examination of 250 wild birds for ecto and endo parasites, special attention being paid to the eyes. The list of birds examined includes 109 domestic birds; of the wild birds examined 5 were found to be infected, or 2 per cent. of the total; of the 109 domestic birds 51 were positive, or 46.88 per cent. In the following list of birds examined, the common and ornithological names are given to avoid confusion:—

		Number Exmd.	Nega- tive.	In- fected.
Bee eater (sacred king- fisher)	<i>Halcyon sanctus</i>	1	1	..
Bower bird .. ..	<i>Chlamydodera orientalis</i>	2	2	..
Butcher bird .. ..	<i>Cracticus destructor</i>	3	3	..
Canary, native .. ..	<i>Ptilotis fusca</i>	4	4	..
Cockatoo, black .. ..	<i>Calyptorhynchus funereus</i>	1	1	..
Cockatoo, white .. ..	<i>Cacatua galerita</i>	6	6	..
Cormorant .. ..	<i>Plotus</i> ( <i>Anhinga</i> ) <i>novæ hollandiæ</i>	2	2	..
Coot, bald .. ..	<i>Porphyrio melanonotus</i>	19	19	..
Crane, white .. ..	<i>Herodias timoriensis</i>	2	2	..
Crane, blue-grey .. ..	<i>Notaphox novæ hollandiæ</i>	2	2	..
Cuckoo .. ..	<i>Eudynamis cyanocephala</i>	4	4	..
Cuckoo, chestnut breasted	<i>Cacomantis castaneiventris</i>	1	1	..
Cuckoo, shrike, black- faced	<i>Graucalus melanops</i>	2	2	..
Curlew .. ..	<i>Numenius cyanopus</i>	1	1	..
Dove, large (wood-pigeon)	<i>Geopelia humeralis</i>	1	1	..
Drongo, fish tail .. ..	<i>Chibia bracteata</i>	6	6	..
Duck, black .. ..	<i>Anas superciliosa</i>	12	12	..
Duck, Indian Runner (penguin duck)	?	13	13	..
Duck, muscovy .. ..	<i>Cairina moschata</i>	3	..	3
Duck, whistling .. ..	<i>Dendrocygna arcuata</i>	12	12	..
Eagle, sea .. ..	<i>Halietus leucogaster</i>	1	..	1
Eagle, wedge tailed .. ..	<i>Uroætus</i> ( <i>Aquila</i> ) <i>audax</i>	2	1	1
Fig bird .. ..	<i>Sphecotheres maxillaris</i>	11	11	..
Fowl, domestic .. ..	<i>Gallus domesticus</i>	52	34	48
Friar bird (leather head)	<i>Tropidorhynchus corniculatus</i>	10	10	..
Frog mouth .. ..	<i>Podargus phalacroideus</i>	4	4	..

		Number Examd.	Nega- tive.	In- fected.
Goose, domestic ..	<i>Anser cinereus</i> ..	2	2	..
Goose, pied ..	<i>Anseranas semipalmata</i> ..	1	1	..
Grebe, hoary headed ..	<i>Podiceps poliocephalus</i> ..	1	1	..
Hawk, brown ..	<i>Hieracidea berigora</i> ..	10	9	1
Hawk, sparrow ..	<i>Accipiter cirrhocephalus</i> ..	1	1	..
Hen, water ..	<i>Gallinula tenebrosa</i> ..	1	1	..
Heron, Nankeen ..	<i>Nycticorax caledonicus</i> ..	2	2	..
Honeyeater, blue faced ..	<i>Entomyza cyanotus</i> ..	1	1	..
Ibis, glossy ..	<i>Plegadis falcinellus</i> ..	3	3	..
Ibis, straw necked ..	<i>Carphibis spinicollis</i> ..	2	2	..
Jay, blue ..	<i>Coracina robusta</i> ..	4	4	..
Kingfisher, Leach's ..	<i>Dacelo leachi</i> ..	10	8	2
Lark, magpie ..	<i>Grallina picata</i> ..	7	7	..
Lorikeet, blue-bellied ..	<i>Trichoglossus nova hollandiae</i> ..	10	10	..
Magpie ..	<i>Gymnorhina tibicens</i> ..	2	2	..
Mocking bird ..	<i>Anellobia chrysoptera</i> ..	3	3	..
Mynah bird ..	<i>Acridotheres tristis</i> ..	11	11	..
Native companion ..	<i>Antigone australiana</i> ..	11	11	..
Oriole, northern ..	<i>Oriolus affinis</i> ..	2	2	..
Owl, brown ..	<i>Ninox boobook</i> ..	1	1	..
Owl, masked ..	<i>Strix nova hollandiae</i> ..	1	1	..
Parakeet, red shouldered ..	<i>Neophema pulchella</i> ..	2	2	..
Pelican ..	<i>Pelicanus conspicillatus</i> ..	1	1	..
Pigeon, barred wing ..	<i>Phaps chalcoptera</i> ..	2	2	..
Pigeon, domestic ..	<i>Columba livia domestica</i> ..	9	7	2
Pigeon, pheasant ..	<i>Macropygia phasianella</i> ..	4	4	..
Pigeon, purple-crowned fruit ..	<i>Ptilopus superbus</i> ..	1	1	..
Plover, spur wing ..	<i>Lobivanellus lobatus</i> ..	11	11	..
Rail, land ..	<i>Eulabeornis philippinensis</i> ..	2	2	..
Sandpiper ..	<i>Tringoides hypoleucus</i> ..	18	18	..
Shag ..	<i>Phalacrocorax carbo</i> ..	3	3	..
Sheldrake, white headed ..	<i>Tadorna radjah</i> ..	2	2	..
Snipe ..	<i>Rostratula australis</i> ..	1	1	..
Spoonbill ..	<i>Platalea regia</i> ..	2	2	..
Sun bird ..	<i>Cinnyris frenata</i> ..	1	1	..
Swan, black ..	<i>Cheonopsis atrata</i> ..	4	4	..
Thrush (babbler) ..	<i>Pomaterhinus rubeculus</i> ..	1	1	..
Turkey, scrub ..	<i>Catheturus lathamii</i> ..	2	2	..
		359	303	56

### Examination of Young Chickens.

Attention is drawn to an examination of one poultry yard, taking only young chickens into consideration. The results are not included in the general list of birds examined. The total number examined was forty-five chicks, ranging from three days to twenty-four days old. The table shows the age and the results obtained, giving positive findings in 32 per cent.

	Number Examined.	Negative.	Infected.
3-day old chicks ..	8	8	0
7-day old chicks ..	12	12	0
10-day old chicks ..	14	12	2
14-day old chicks ..	3	0	3
18-day old chicks ..	2	0	2
24-day old chicks ..	8	1	7
10-21-day old muscovy ducks ..	3	1	2
<b>Total</b> ..	<b>50</b>	<b>34</b>	<b>16</b>

Worm parasites from the eyes of domestic birds were first found by Dr. Manson at Amoy, China; these were described by Cobbold (1879) as *Flaria mansonii*. Since that time this parasite has been recorded in other parts of the world, and appear to be closely associated with the two tropical lines of Cancer and Capricorn. The following are the places from which the parasite has been recorded:—Florida (Niles 1904), Ransom; Jamaica (Clark 1904), Ransom; Mauritius (Emmerez 1901); Isle of Reunion (Ozoux 1910); Brazil (Megalhaes 1888); Guam Ladrome Islands (Barber 1916); Hawaii (Norgaard 1918); Java (Penning 1894) (Smit 1918); Annam Indo-China (Carougeau 1902); Rabaul Mandated Territory of New Guinea (Heydon 1926), Fielding; New South Wales (Johnston 1909-10); North and Central Queensland (Tryon 1907-8), (Dodd 1909), (Sweet 1910), (Breinl 1913), (Nicoll 1914), and (Fielding 1926); the latter author records finding it in the muscovy duck, *Cairina moschata*.

In a recent paper on the subject, the present writer draws attention to having obtained specimens from inland centres, thereby dispelling the idea that it only occurs on the sea-coast. Ozoux (1910) drew attention to its occurrence in mountainous districts on Reunion; Smit (1918) states that Neveu-Lemaire says that the parasite does not occur on the sea-coast.

As pointed out by Fielding (1926), various experiments have been carried out on the question of the elucidation of the life history, and has himself been working on the question for the past twelve to thirteen years, during which time some thousand or so experiments and dissections, which were the fore-runners of the findings tabulated by him, were carried out. He shows that the cockroach *Pycnocellus (Leucophaea) surinamensis* L. is responsible for the transmission of the parasite, and succeeded in infecting young and old ducks and young chicks experimentally by feeding the cockroach to the birds, and that the time taken for worms to appear in the eyes of birds, after having swallowed the roaches, is very short.

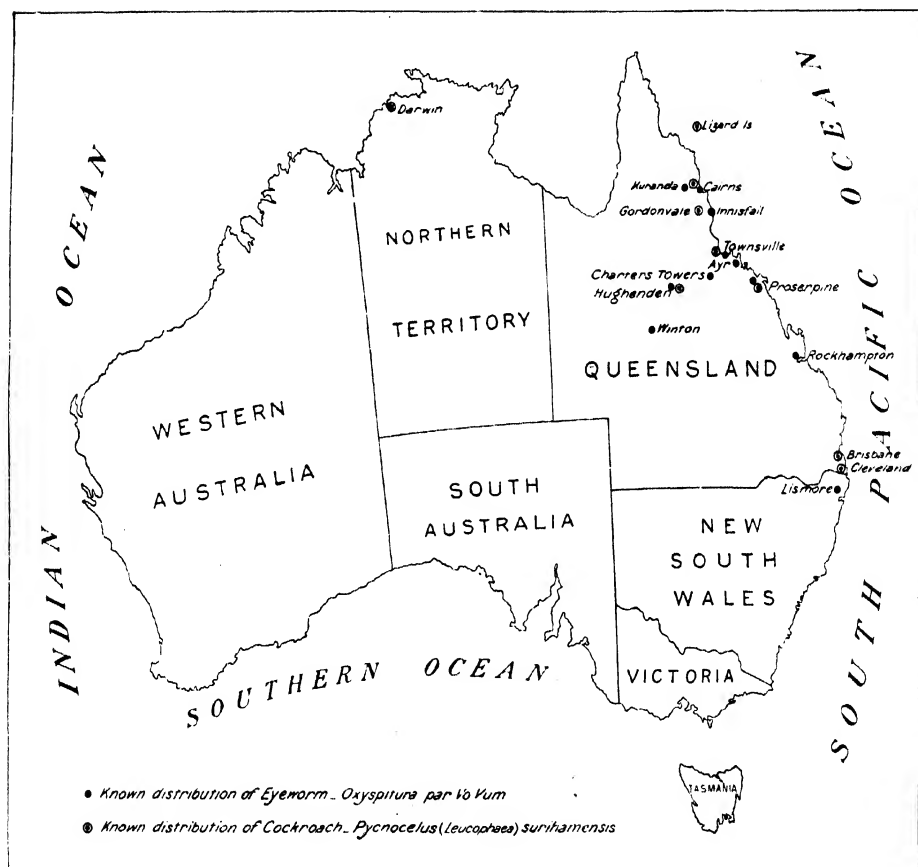
That there is an association between the eye-worm of poultry *Oxyuris pycnocelae* and the cockroach *Pycnocellus (Leucophaea) surinamensis* in Australia is evident on consulting the map showing the distribution so far as is known at present. This is further accentuated on taking the known distribution of *O. mansonii* and the cockroach into consideration throughout the world, which shows that of the places where the worm parasite is known six have also the cockroach. So far we have no records of the occurrence of the roach in Indo-China, Guam, or Rabaul, Mauritius, Reunion, New South Wales, Florida, Jamaica, but owing to the fact that it has been recorded from adjacent places, it is hardly conceivable that it does not occur in the places mentioned. As regards Florida and Jamaica we would draw attention to Doucette and Smith's statement that it occurs on the eastern portion of the United States, and has also been recorded from Mexico.

### General Sanitary and Hygienic Considerations.

It is undoubtedly of first importance that the general sanitary and hygienic condition of the poultry yard should be attended to. Even under the ordinary rules of poultry keeping the first essentials are—open air, light, cleanliness, and careful feeding. Infinitely more necessary is it that these conditions should be given with a disease of such importance as the one under review. It is considered that in an endemic area the poultry yard should have a minimum of shade so that the penetrating and sterilising effect of nature's own disinfectant can be made of more use—viz., the sun. This minimum of shade is not only meant in the ordinary sense but also as regards shade for insect pests in the fowl-house and yard generally. The yard should be thoroughly cleaned, and the droppings cleaned up at regular intervals and spread out in the sun to dry and eventually burned. All bags, boxes, boards, and other material which might serve as hiding-places for cockroaches, crickets, and other insect pests should be burned. Disinfectants should be sprayed at frequent intervals around the fowl-house and shady spots, or powdered lime, borax, or sodium fluoride mixed with flour should be sprinkled wherever cockroaches are prevalent. Recently in the United States, Doucette and Smith (1926) have recommended the use of a solution of sodium cyanide sprayed on the soil for the destruction of the cockroach which is now known to be responsible for the transmission of eye-worms of poultry. As they were working under conditions totally different from those obtainable in a poultry yard, and as this solution is a deadly poison, it should be clearly understood that the birds would have to be segregated during operations, and all refuse and detritus cleaned up afterwards. Even then there would appear to be a certain amount of risk attached to its use, owing to the fact that the fowls scratching around in the soil for tit-bits may pick up some particles impregnated with the compound. On general grounds the feeding should be carried out on the hopper principle, and the drinking water supplied on the fountain system.

### Treatment.

Various methods of treatment, aiming at the destruction of the worm parasites of the eyes have been put forward, but to appreciate fully the effects of any treatment, it would appear necessary to point out that there is a wide space all around the eyes communicating with the beak and mouth called the infraocular sinus, through which the tears drop into the buccal cavity, and that the worm can and does pass out from the eyes through this sinus into the mouth, or from one eye to the other, thereby evading for a time the effects of the treatment of the eyes. Obviously, whatever method of treatment is given, it is necessary, to get the best results to carry the treatment to the only means of escape for the worms from the eyes, viz., the opening into the mouth of the sinus. This end is accomplished by painting the opening with the solution by means of a camel-hair brush.



The following solutions have been suggested:—(a) Dropping a solution of sodium bicarbonate into the eyes. (b) A similar proceeding with chloroform. (c) First anaesthetise the eyes with a 5 per cent. solution of cocaine, by drawing apart the eyelids and pouring a few drops of the cocaine into the eyes, allowing this to act for some time, and afterwards drawing up the nictitating membrane and placing a few drops of 5 per cent. creolene underneath. (d) By forcibly extracting the worms by means of a small pair of forceps (this is a dangerous practice and is better left alone). An improvement is here suggested, viz.,—a small camel-hair brush. This method has been used for some years and has been found to answer quite well, but requires plenty of time and patience; even this is objectionable

owing to the creation of inflammation of the eyes. (e) Placing a small quantity of turpentine and allowing it to act for half an hour, followed by irrigation of the eyes with lukewarm water. (f) A weak solution of potassium permanganate (Condy's crystals); this is somewhat slow in action, and should be continued daily for a week or so. Further treatment directed at the alleviation and cure of the inflammatory and catarrhal conditions by irrigation of the eyes with a mild antiseptic as 4 per cent. boric acid. Ransom suggests the use of a mixture of nine parts of lard and one part of iodoform or carbolic vaseline.

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## TURKEY REARING.

P. RUMBALL, Poultry Expert.

There has been a serious falling off in the number of turkeys kept in Queensland during recent years, of which ample evidence is supplied by the Registrar-General in his annual reports.

This decline in numbers cannot be attributed to the lowered value of turkey flesh, as excellent prices are generally realised for good birds in the local markets, and in seeking the cause, one is forced to the conclusion that faulty methods of breeding and disease are the principal factors, although seasons and the ravages of foxes have probably played their part.

### Suitable Localities.

The farm, by reason of offering turkeys ample range, thereby enabling them to indulge in some of their wild traits, is its natural home. Free range also enables turkeys to gather considerable quantities of their own food in the form of grass, insect life, and when stubbles are available, grains. Districts in which the soil is of a light nature and undulating is more suited to turkey raising than low-lying wet country. Scrub country offers ideal conditions, especially where there is a good supply of green feed and water.

### Housing.

It is natural for turkeys to roost in the open, but, when there is no suitable belt of timber to afford protection, certain housing methods should be adopted to obtain the best results. These houses need not be very elaborate, but should be so constructed as to permit of a free circulation of air. Old open-fronted lofty barns are well suited for this purpose, but in districts in which turkeys have to be protected from the fox it may be advisable to adopt the following system:—Enclose an area of land, about  $\frac{1}{2}$  an acre, with a 6-foot netting fence, and build a shed in the middle. This shed should face north, and be open in front with a 6-inch space between the back of the top wall and roof. The dimensions would vary according to the number of birds to be housed, but each bird should have a floor space of 15 square feet. The house should be 9 feet high in front and 7 feet at back. Perches should be about 3 feet high, all on the same level and 3 inches wide. Suitable nests could be placed around the enclosure and made to look as natural as possible with the help of bushes. The turkeys could be confined to these quarters at night, and allowed range during the day.

### Breeding Stock.

There are several varieties of turkeys, but the American Bronze holds pride of place. This is a large and hardy breed, which has supplanted most other breeds, and appears to be well suited to our climate as well as our markets. Mature stock should only be used for breeders, two years and over being more suited than stock only a year old. One vigorous Tom can be mated with as many as ten hens, but probably six to eight females on the average would give better results.

In selecting, strength and vigour, coupled with the knowledge that your stock are from healthy parents, is of primary importance. The head should have a clean and healthy appearance, body compact and long. Sturdy shanks and strong toes with fair-sized bone indicating stamina.

Extra heavy show specimens do not make the best breeders. What is required, is stock in good hard condition and not fat; on the other hand, stock that are thin should never be used, as the lack of condition may be due to some inherited weakness. Hens weighing 16 to 18 lb. and Toms 25 to 30 lb. in fair condition will be found to give satisfactory results.

Avoid in-breeding and endeavour to obtain occasionally new Toms from reliable stock, but before buying make sure that he comes from healthy parents, and take further precautions by isolating him for some two or three weeks. The best hens raised on the farm should be reserved for breeding purposes, and not sold because there is a good market.

### **Hatching by Natural Methods.**

Vermín must be carefully guarded against and when nesting in enclosed quarters, both the hen and the nest should have a good dusting with insect powder for a start, and again a few days previous to hatching. By taking these precautions you assure the young poults of a start in life free from vermin, which is a great aid to successful rearing. A turkey will only cover properly fifteen to eighteen eggs, and it is a good plan to set a few eggs under broody hens at the same time as the turkey is set, and when hatched to give all the chicks to the turkey, as she can comfortably mother about twenty-five. Food, water, and grit should always be handy to the sitting hen, and if the Tom is at all savage it is advisable to protect the nest and young.

### **Rearing.**

It is found best to let turkey hens mother the chicks. When hatched, the young poults should be left undisturbed until thoroughly dry, they then may be temporarily removed to induce the turkey to remain on the nest, if it is found that the eggs are hatching irregularly. After the hatch is complete a coop which affords protection from wind, rain, and dampness should be provided. This coop should permit of a free supply of air and be moved on to new ground daily. The hen and poults should be confined to the coop for ten days to a fortnight, but if the weather is fine the poults may be allowed a little liberty when the dew is off the grass; after this period it is generally safe to allow range, providing the grass is not too long and wet. When they have reached the age of five weeks, entire liberty can be given, allowing them to roost in barns, houses, or trees, according to the policy adopted.

### **Feeding.**

No food should be given for at least forty-eight hours after hatching. Hard grit, charcoal, and water should be the first food provided. The hard grit assists in mastication and charcoal has no equal as a bowel corrector. Turkey chickens will gorge themselves if allowed, and this gorging is responsible for a considerable amount of trouble. Turkeys in their wild state would gather their food very slowly, and it is found best to imitate them as far as possible by only feeding the young chicks a little at a time and fairly frequently. This prevents them from over-loading their digestive organs and helps to retain that keenness of appetite which is essential to successful raising of poultry of all kinds.

Stale bread soaked in milk and then squeezed fairly dry is the most handy food on the farm and also gives excellent results. This can be fed five times a day for a few days, and variety can be made by the replacement of some of the meals with chick grains, mashies of brand and pollard mixed with milk, to which can be added a small amount of minced meat and tender green feed. This mash should be made crumbly and not sticky. When on range the quantities of food will vary according to what they can gather for themselves, but surplus milk can be fed at all times either thick or fresh, but it is as well to always feed it in the same condition. Green feed should be fed in abundance to both growing and adult stock, but where range is allowed on good green pasture it is not so important.

Grains should always be fed at night and so induce the flocks to return to their camps. Oats, maize, and wheat are suitable for this purpose.

In the management of turkeys, especially in the rearing of young stock, cleanliness is essential. Food should not be allowed to lie about or become decomposed, and a strict outlook must be kept for vermin of all sorts.

### **Diseases in Turkeys.**

Turkeys are subject to practically the same diseases as other classes of poultry, but mention is made here of the most common and devastating diseases affecting the problem of turkey raising.

#### **Black-head, Hepatitis, White Diarrhoea, &c.**

This disease was given the popular name of black-head owing to the darkened appearance of the head of affected birds. The general adoption of the name is unfortunately misleading, as the darkening of the head is not noticed in all cases.

Old and young stock are affected, but heavy mortality is principally met with in young stock a few weeks old. The external symptoms are drowsiness, lack of vigour, and loss of appetite. Diarrhœa is nearly always present and of a yellowish colour, though sometimes white, due to the abnormal percentage of urates. The disease usually appears in the intestinal tract, the cæca being the most seriously affected. The liver quickly becomes affected.

*Cause.*—Bacteriologists do not agree as to the particular organism which causes this disease, but they do, however, assert that it can be transmitted from mother to progeny by means of the infection of the egg, hence the necessity of obtaining stock free from the trouble. It is also readily transmitted from one bird to another through food coming in contact with the droppings from diseased stock.

Medicinal treatment has not proved successful, but where stock has been recently infected the following remedies may be adopted as a means of arresting the disease:—Thorough cleanliness of quarters and disinfection with a 5 per cent. carbolic acid solution. A teaspoonful of hydrochloric acid to a quart of drinking water often gives good results. Sour milk, by its action in keeping the intestinal tract in an acid condition, is also of value.

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## MAIZE AND LUCERNE.

Maize is one of the most valuable cereals grown in the State, and is used extensively as a fodder in the drought periods, saving thousands of merino sheep that are now grazing on the Western downs.

It is difficult to over-estimate the value of such fodder crops as maize and lucerne and the service they render to the live stock industry in the trying periods of drought. The value of the activities of our agriculturists throughout the State cannot be solely estimated on the basis of the market value of the maize and lucerne produced. To such values must be added that of live stock saved by feeding drought rations of maize and lucerne and so preserving an industry that contributes largely to our national wealth.

Favourable seasonal conditions have yielded heavy crops of these fodders, but market values have fallen below the cost of production. A surplus over the immediate market requirements depresses values, and the producer suffers in consequence. With our varying climatic conditions surpluses and scarcity of fodder often follow at intervals that are altogether too brief.

Conservation of fodder is of really vital importance to us all. Lucerne and maize are especially suitable for conservation purposes. Our pastoralists where practicable might insure the lives of their stock by purchasing and storing maize and lucerne hay in silos or lofts. At the market prices ruling in times of plenty for such products the premium is most reasonable. By taking steps in time to make their position more secure, they will also render a great service to primary producers engaged in the production of fodder crops by stabilising the market for them.

The menace of a prolonged dry spell has been lifted from most of the pastoral and agricultural areas of the State, and the future of both will be brighter and more secure if those controlling the pastoral industry will, where possible, make a special effort to purchase maize and lucerne for the purpose of storing for a lean period. Seasonal conditions will repeat themselves, and a period of high production is frequently followed by a subnormal season.—From Field Notes—by C. McGrath, Supervisor of Dairying.

### A FARMER'S APPRECIATION.

*Renewing his subscription, a Nambour farmer writes—*

*"I would like to add my congratulations to the Department for making available, at a small cost, such valuable information to the man on the land."*

### GLASSING SMALL CLIPS.

From a radio address by Mr. J. CAREW, Acting Instructor in Sheep and Wool, and continued from the June issue.

#### Marketing Wool.

The system of placing wool on the market must be taken into consideration. Five bales of wool, each 200 lb. or over, of a given class are placed in the general catalogue by the wool brokers, and therefore meet with keener competition at the auction sales than if in lines of less than five bales each. The latter are placed in the star lots, where speculators usually buy them up to repack into longer lines to be again put on the market in the general catalogue. In the classing of small clips the fleece wool should be worked into bulk lines. The main idea being to class into lines as even as possible, but at the same time make as few sorts as possible. There are three chief factors that are taken into account by the buyers when coming to a conclusion on the value per lb. of greasy wool—namely, spinning qualities, length of fibre, and yield. In the lastmentioned is meant the actual weight of clean dry fibre, after all yolk, vegetable, and other extraneous matter are removed. Length of fibre is considered in respect to the process to which the different lengths of fibre are suited in preparation for yarn and subsequent manufacture. Spinning quality means the actual length of yarn that can be spun per lb. of top or sliver.

Woollen yarns differ from worsteds in that they contain all the fibres that are in the particular class of wool from which the yarn is spun. Worsteds yarns on the other hand have all short, weak, knotty, and cross fibres combed out before they reach the process of spinning. All fibres are lying parallel to each other, thus enabling them to be drawn out and spun into a more symmetrical and even yarn. To suit this combing process the wool must be of a given length, at least 2 in. for English and Australian manufacture for worsted top making, while on the Continent shorter wools can be used; they must, however, be sufficiently strong to withstand the strain of the combing machines.

In merino combing wool we have what are known as the warp and the weft classes, which indicate the requirements for the weaving of worsteds. In this respect the threads that form the foundation of the cloth are known as warp yarns, and are placed lengthways in the loom. These warp yarns are spun from a sound wool of a greater length than the weft yarns which can be much weaker, just sufficiently strong to stand the weaving as they form the cross yarn to be woven into the fabric.

It can readily be observed that the grower's main object should be to have the wool classed to meet the demands of those purchasing the wool for manufacture, thus enabling them to secure the desired class for their special purpose. These top makers use combing wools only, and if any wools are included that are too short or too weak for top making purposes they must get rid of it again.

#### The Departmental Wool Scheme.

If the flock is so small that the fleece wool cannot be got into the bulk lines, and is still kept fairly even in length, spinning qualities, and condition, the grower is going to sell his best wools at a disadvantage, for the value is likely to be based more on the low wools contained in the parcel. It is because of this disadvantage under which the farmer with a small flock is suffering that the Department of Agriculture and Stock receives and classes any farmer's clip from flocks of 1,500 sheep and under. No lot is too small for consideration, and all wool received is classed according to its grade. When these wools are received they are weighed and an average value placed against them. If required, an advance of 60 per cent. on the Departmental value is remitted to the owner without delay. The balance due is forwarded, less expenses, on realisation in the market.

In grading these wools, the main features considered are length, colour, condition, and soundness, and the several qualities found in merinos and other different breeds and grades. Each separate class is a distinct and even line, showing the particular type to which it belongs. A line may contain any number of farmers' wools, each of which has been weighed as it is sorted into the respective classes and placed in the bin. The only preparation necessary on the part of the grower is the rolling of the fleece having the tip sides inward, after the dags and stains are removed, before being placed in the bale or other package. When the wool is baled, a distinct brand should be placed on the cap of the bale. Under this scheme handling and all other charges have been reduced to a minimum, in order to encourage farmers to keep sheep even if only in a very small flock.

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## DROUGHT FEEDING OF STOCK.

By RALPH V. HOLE, Manager of Warrana and Bimble Stations,  
Coonamble, New South Wales.

*Some time ago the "Pastoral Review" offered three substantial prizes for the best contributions by subscribers or their managers or overseers on actual and practical experiences in the drought feeding and management of stock. Following is the first prize essay which is reprinted from the "Pastoral Review" for last April, and to which we are indebted.*

**T**HIS essay covers experience of hand-feeding over a period of almost seven months. Commencing on 6th May with 10,000 sheep, the numbers were increased until a maximum of 88,000, including 13,000 April-May lambs, were being fed, and finally ceased 3rd December, when sufficient natural feed was available.

Following a prolific growth of herbage in the winter and spring of 1926, the early summer was dry, and although large quantities of dry herbage remained, sheep did not thrive on it, and toward the end of the year rapidly lost condition. The low nutritive value of the dry herbage was very unusual; this was attributed to fouling by aphids and a species of caterpillar, also to the sudden advent of summer heat while the growth was still sappy and overgrown, which prevented it from coming to maturity and seeding. It was noticed that a great deal of trefoil did not seed, and where the seed did form that it contained no kernel.

Three hundred and twenty-three points of rain in January, 1927, gave temporary relief, but was not followed up, and during the succeeding eight months only 3.36 inches were recorded, and that in small falls of no value. By the end of April most of the country was getting bare and stock commencing to lose condition, so hand-feeding was resorted to in May. The extremely cold winter—the severest for many years—made conditions very hard for stock. Heavy frosts, followed by bleak winds during the day, prevailed for weeks, and stock on the open country got no relief, day or night, and with drought thrown in made it the hardest time in my experience. These introductory remarks may convey to the reader the general conditions prevailing prior to and during the drought.

### When to Commence Feeding.

In all cases hand-feeding was resorted to while the stock were in really good condition, and a little natural feed remained, and to this undoubtedly the ultimate success of the operation was due. Commencing with a small ration, the sheep were used to and thoroughly broken in by the time they were altogether dependent on the artificial feed. They retained their condition for many weeks, whereas had they been left until their condition was gone, it would have been almost impossible and prohibitive in cost to build them up again. A good reserve of strength and stamina is necessary, otherwise a heavy loss may occur when rain does come, either from bogging in heavy country or if full-woolled from inability to carry the wet fleece, and this when relief is actually in sight.

Again, in wet weather, except on very favourable country, it may be impossible to feed, owing mainly to difficulty of transport and waste. I cannot emphasise too strongly the vital importance of commencing early while sheep are in good condition. This particularly applies to ewes in lamb, and will be the means of minimising loss in both ewes and lambs.

### Selection of Feeding Grounds.

These were chosen close to water, on hard, level ground, free from holes and cracks. The sites were selected with sufficient area to permit of moving to either side as the ground became dusty, and after a spell the wind cleaned the original ground ready for use again.

### Method of Distribution.

Motor vehicles were chiefly used to distribute the feed from depots, made at convenient places to serve several paddocks, and which were kept supplied by the heavier lorries carting from the railway. The sheep were quietly mustered to the feeding ground, and the feed trailed in a thin stream from the corner of the bag in a complete circle around them. They were then moved on to the trail, and held for a couple of hours. In some cases a little lucerne hay was used to coax them to take grain—maize being spread about, and on the hay. This procedure was only adhered to until they took to the feed, and then broadcasting was adopted.

The feed was tipped loose in the lorry and mixed, and on arrival at the ground where the sheep were mustered ready, the driver quickly circled round the mob, and then backwards and forwards through the centre, the second man broadcasting with a wide shovel, one throw to the right, the next to the left, giving the shovel a swish to distribute the grain over the greatest possible area, to avoid crowding. Where lucerne hay was used, it was left in the bundle with the bands removed for the sheep to pull at themselves. Opening it up proved too wasteful.

Sheep soon learn to draw to the ground of their own accord, but always the paddocks were ridden, to make certain none were away. Lambing ewes were successfully fed in this way, the only difference being any ewes with green lambs were left alone until they came in themselves. Being broken in beforehand, they were very little trouble, and loss in lambs was very little above normal. A horseman was always at the feeding ground to hold the sheep and prevent them rushing to meet the lorry and from following it away.

It was found necessary to have the sheep at the ground to rest awhile before being fed, otherwise weak sheep were tired and not inclined to feed. To avoid mustering to a central ground, we tried running round the paddocks and feeding wherever they happened to be. This method was an absolute failure and speedily abandoned for the reasons that the sheep knocked themselves about racing after the lorry, and it was impossible to feed them properly and ensure an equal ration.

In some lots the "tail" sheep were drafted off and fed with a heavier ration, which proved successful in levelling them up again. Between 10 a.m. and 2 p.m. proved the best time to feed. Earlier, the sheep, instead of drawing in themselves, had to be driven, and later got restless and inclined to walk off the camp. Flock sheep were fed in lots of from 500 to 2,000, and although one lot of 3,400 was successfully handled, the smaller lots were easier to feed.

### Ration per Head.

The daily ration was 2 oz. per head for the first month while they had a little dry feed. It was then increased to 4 oz., at which it remained for from two to three months, sheep doing well on it. As the weather became colder and the country devoid of feed of any sort, it was again increased to 6 oz. Towards the end of the drought a further increase to 8 oz. was made in some lots, but it was noticed that no improvement came with the last increase.

This confirmed a previous experience that there is a limit to the time sheep will thrive on a concentrated ration alone, and must have bulk with it. With paddock roughage or scrub, they will do well, and always provided feeding is commenced in time, will carry on for from eight to ten weeks on the concentrated ration alone, but after this period will cease to thrive. To combat this, in October and November, some lots were given  $\frac{1}{2}$  lb. lucerne hay daily, the maize, &c., being cut down to 4 oz., when the improvement was immediate and most marked. The best results were obtained with 4 oz. for the first period, and then 6 oz., and when they ceased to thrive on this, 4 oz. grain and  $\frac{1}{2}$  lb. lucerne hay. The feed consisted of half maize and half either Thorpe's Kubettes or Meggitt's Nuts. The commencing ration of 2 oz. is only of benefit with a fair amount of natural feed, but serves to break them in.

Ewes rearing lambs were allowed the same ration, with an addition for the estimated number of lambs in each lot. With ewes in lamb, it is necessary to give hay or bulk as soon as paddock roughage becomes scarce. Stud sheep and flock rams were fed 6 to 8 oz. maize and Thorpe's Kubettes, and  $\frac{1}{2}$  lb. to 1 lb. lucerne hay, and did very well, finishing in fine condition.

### Value of Fodders Used.

Maize, Thorpe's Kubettes, Meggitt's Nuts, and lucerne hay were used, and with one lot of lambs and some cattle, several stacks of old coarse wheaten hay. Scrub was only available in a few paddocks—box, wilga, and belar were used in these. Maize was used as the foundation feed, and it is undoubtedly the best. It is both sustaining and heating, is easily handled, there is no waste, and when broadcasted, sheep have to search for it, thereby giving the weak sheep and slow feeders a chance to get their ration. The big flat-grained maize, either white or yellow, was found to be fully 33 per cent. of more value than the small, hard, red variety. At one period we had to use several trucks of the latter variety, and the result was immediately noticeable, the sheep cutting up badly.

Thorpe's Kubettes, containing as they do a variety of grain, all of good feed value and a high percentage of proteins, are an excellent fodder, especially when

fed with maize, and were used largely with success. This particularly applied to weaners and young sheep. They take readily to them and do not go "stale" as on maize, and will hang on for a long period. The same applies to Meggitt's Nuts, the oil contents of which are valuable and which perhaps are superior for lambing ewes and during period of gestation. It is a good milk producer and is laxative, the latter quality being noticeable in the moist and soft droppings of the sheep.

The three varieties of scrub were used with maize, &c., but were found to be of low value and hardly warranted the expense of cutting. They certainly were of some help with young sheep, but with aged ewes and ewes in lamb caused mortality, and were discontinued.

Coarse, dry wheaten hay, containing no grain, was fed to one lot of 2,000 lambs. They were taken from their mothers at three months and put in a 10-acre paddock. The hay was fed at first moistened with molasses water, and later they were given access to the stacks. In addition they had the ration of 1 oz. maize and 3 oz. Kubettes. They held their condition for over two months, and until sent away on feed in November. An outbreak of eye blight, commonly known as "Pinkeye," caused a small mortality among them. Seventy cows suckling calves were also fed with this hay well moistened with molasses, being allowed 10 lb. daily, it kept them for three months. The dry cattle eked out a living on belar, which they themselves could reach, and although they lost condition, managed to survive until both lots were sent away in November. Lucerne hay proved excellent fodder for both sheep and cattle, but its value is largely discounted by the high cost of handling, the large percentage of waste, and the impossibility of ensuring an equal ration for each individual.

### Water.

Bore water of excellent quality was available in most paddocks. The drains are small and were frequently delved and kept in order so that sheep got a drink of fresh, clean running water without congestion or crowding, and without bogging. With any of the ground tanks in use that commenced to bog, the batters were cleaned with a "Nelyambo" scoop, leaving a clean, hard surface; one cleaning sufficed for from six to eight weeks. Some of the tank water, when low, was inclined to become stale; an improvement was noticed among sheep moved from this to bore water.

### Lambing.

Owing to 68 per cent. marking in December, 1926, the autumn drop was light, being 31 per cent., except with 6,000 ewes, not previously joined, which marked 84 per cent. Most of the ewes were fed while lambing, and reared their lambs for about ten weeks and then weaned them. No loss was incurred from marking, but a mortality estimated at 15 per cent. occurred from malnutrition, when the lambs first took to the feed, and for which maize was responsible. When they first take to feed they are inclined to swallow the maize whole. Had we been able to confine their ration to Kubettes this loss would not have occurred, as this feed is readily digested even by very young lambs.

The balance eked out a living on the feed until relief came, and are now growing and doing well. In all, 13,223 lambs were marked in June, and shearing count in October was 9,829, a shortage of 25.66 per cent. Rams were joined in June, and we are now (January) marking a 65 per cent. drop.

### Shearing.

This work commenced at Warrana, 1st July, and at Bimble, 25th July, and both sheds cut out 19th August. We were anxious to complete this work early and get the wool off, but, as the season turned out, it was too early, and the exceptional cold caused losses. Feeding was continued at both places during operations, with the only difference that sheep being handled were fed twice daily, and for convenience feed depots were made along the routes to the sheds.

Sheep were yarded in small lots, just sufficient for half-day's shearing, and only ewes and lambs were drafted. Immediately prior to entering the shed they were fed, and straightaway after each run of shorn sheep was counted they were let out and fed and removed to the most sheltered paddock available. On many occasions the sheep shorn during the last run at night were fed and put back under cover for the night, and to gain time for this the clock was put forward thirty minutes. These precautions were successful in avoiding heavy losses which occurred elsewhere off-shears. Only one lot of lambs was shorn at this time, the balance being shorn at the end of October.

### Licks.

Salt and molasses were freely used and proved beneficial, molasses being both nutritive and laxative. Vita Lick (drought formula) was also used with good results, although a little difficulty was experienced in getting sheep to take to it. In my opinion, a lot more use could be made of scientifically prepared licks in both good seasons and bad. By this I do not mean any haphazard mixture, but a corrective lick, prepared after an exhaustive analysis of soil, water, and natural fodder in various localities, and this would be welcomed by pastoralists generally.

### Losses.

In the drop of autumn lambs, losses already have been dealt with. The extreme cold during August and September was responsible for the greater part of the loss incurred, and sheep even in fat condition cut up badly for some time after being shorn, and continued to do so until the advent of the warmer weather.

The loss "in the wool" was negligible, and all sheep went to the shed in good condition. The heaviest losses occurred in one lot of 20,000 December 1926 drop weaners, and three small lots of aged ewes. The weaners had a check, when dropped, from which they barely recovered, when drought conditions again prevailed. They proved an extremely hard lot to handle, being shy feeders, generally very touchy, and at an awkward and delicate age. The loss in these was 11.22 per cent.

The aged ewes died after being shorn, and again a heavy mortality occurred in November, just before they were due to lamb. Had the value of these ewes justified it, a ration of hay would, I am sure, have saved most of them. The paddocks were absolutely devoid of feed of any sort, and all they got was the concentrated ration, which carried them along until about a month before they were due to lamb, when they ceased to do on it. Their age and value did not warrant any further expense in trying to save them. The loss, finally, in these was 50.55 per cent. In the balance of almost 50,000 sheep, comprising ewes one to 4 years old, and rams, the loss was 5.10 per cent.

### Costs.

These are computed at per 1,000 for the calendar month, and include all expenses mentioned:—Cost of fodders used, with rail and road freight; cost of distribution, including running costs of motors, and wages of men looking after paddocks. Deduction of rail rebate on fodder is also taken into account.

The daily ration of 2 oz. maize and 2 oz. Kubettes, £47 4s. 8d., or 2 oz. maize and 2 oz. Meggitt's, £53 18s. 2d. per 1,000.

The later ration of 3 oz. maize and 3 oz. Kubettes, £68 5s. 11d., or 3 oz. maize and 3 oz. Meggitt's, £78 6s. 2d. per 1,000.

The last ration used of 2 oz. maize, 2 oz. Kubettes, and  $\frac{1}{2}$  lb. lucerne hay cost £90 15s. 8d. per 1,000.

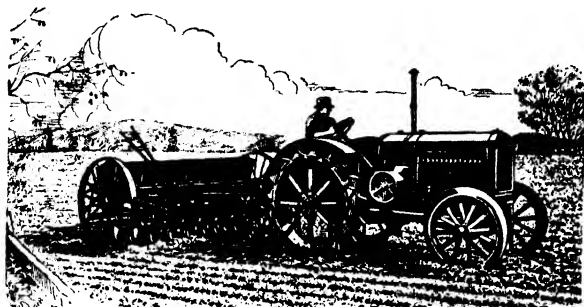
These figures are taken from the actual cost of handling and feeding one lot of 14,000 sheep, and are as nearly accurate as possible.

### Conclusion.

From 15th July to 8th August, 3,770 killable aged ewes were sent to Flemington, in the wool; 6,400 ewes were sold and delivered off shears in August. Following relief rains in other districts, from 10th October to 14th November, 31,770 sheep were trucked to various destinations on agistment. These comprised 14,000 ewes forward in lamb, the balance being young dry sheep. They were given an extra ration of grain and  $\frac{1}{2}$  lb. hay before being trucked, and not one death occurred in the trucks, but a small mortality was met with after they reached the feed. The balance remaining was fed until relief came in December.

The experience contained in the foregoing proves it is only possible to feed sheep with success on a highly concentrated feed that is easily and economically transported and handled, and convenient rail facilities must be available. A whole ration of any bulk fodder is prohibitive in cost and wasteful, and owing to the difficulty of quick distribution it will be found impossible to ensure an even ration.

The most important factors toward success are to commence early and conserve the condition on the stock, regular feeding, also measuring all quantities, and constant personal supervision to direct the frequent small changes necessary, and which will, at once, be apparent to the eye of the practical sheep man.



## More Work to the Gal. on Cross

MINYIP,  
5th September, 1927.

I have much pleasure in giving you the results of a kerosene test I held in my Vickers-Aussie to-day, drawing a 19 Tine Scarifier. I used a gallon of kerosene in each test, and marked the distance run on same. I used Cross Kerosene, "....," "...." and "...." Cross was the best of all, and the following is the distance put up by each kerosene:—

"Cross" Power Kerosene -	106 chains
"....,"	105 chains
"....,"	97 chains
"....,"	99 chains

I would like to say that I held this test to convince myself.

(Sgd.) R. SCHURMANN

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## SOME ASPECTS OF STOCK-FEEDING IN AUSTRALIA.

By E. H. GURNEY, A.A.C.I., Senior Analyst, Department of  
Agriculture and Stock.

*Paper read at the Hobart Meeting of the Australasian Association for the Advancement of Science, January, 1928.*

**T**HE great areas of grazing land in Australia with their varying soil types, climatic conditions, and plant growth, in conjunction with financial, labour, and market conditions, have influenced the existing methods of stock feeding of this country.

A review of the stock-feeding methods in Australia then would demand that all the foregoing factors be taken into consideration, but this paper only touches upon a few aspects of the matter which, though recording data already known, it is thought, if such were appreciated more generally by the stock feeder, the result would be beneficial, both to the individual and the Commonwealth.

### The Importance of Mineral Salts in Stock Food.

It is interesting to mention some statements that have been made in literature concerning the importance of mineral salts in the food of stock.

The following extracts are from "Farm Foods," Emil Wolff (English Edition, 1895):—

"Lack of potash is not a probable contingency, as it always occurs largely in vegetable foods. The addition of lime and phosphoric acid to the diet of milch cows is always worth consideration, but is not often necessary."

Again—

"In feeding young animals the greatest care is necessary with regard to the phosphoric acid and lime in the food supplied. The other mineral constituents, such as potash, magnesia, and iron are always supplied in plenty and need no especial provision."

Wolff, in illustrating rations deficient in lime and phosphoric acid, states—

"The addition of a little chalk to the food in the form of powder or of 'lick-stones' is evidently desirable under such conditions of feeding as the above. Phosphoric acid can be provided artificially in the form of phosphate of lime. Experiment has shown that this latter substance is capable of assimilation by calves and lambs, and it has been found of great benefit to foals.

"The food of young animals reared artificially should always contain two to three times as much lime and phosphoric acid as that actually required by the animals."

In "The Feeding of Animals," W. H. Jordan, 1901, the following occurs:—

"The ash or mineral part of plants or animals occupies a minor place in the discussions which pertain to the principles and problems of animal nutrition. Much is said and written about the carbon compounds of living organisms, but the compounds of the mineral world, in their relation to foods and to the processes of growth, are generally passed with brief comment, much less than would be profitable. It is certainly desirable to gain a clear understanding of the combination, distribution, and functions of these bodies. Their importance as necessary constituents of foods and animals is no less than pertains to the carbon compounds, although their scientific and commercial prominence as related to animal nutrition is much less."

J. Alan Murray, in "The Chemistry of Cattle-feeding and Dairying, 1913," after mentioning the function and value of ash ingredients, states—

"To sum up, it may be said that of the ingredients of the ash some are of vital importance in the economy of both plants and animals. Others, though normally present, are probably not indispensable, but may be of use indirectly. From the point of view of the practical feeder, they are all unimportant inasmuch as they are always present in the natural food of the animals. If the food be sufficient in quantity and suitable in other respects, it will certainly contain enough 'mineral salts' for all ordinary purposes. It is unnecessary, therefore, to add any ash ingredients, except common salt, to the ordinary rations of animals."

The following extracts are from "Feeds and Feeding Abridged," Henry and Morrison, 1926:—

"The common feeding stuff contain all the necessary mineral salts, at least in small amounts. As a rule, the roughages, except some of the straws, are much

richer than the grains in mineral matter. Moreover, the body is probably able to use many of the mineral compounds over and over again, taking them back again into the circulation after having been used. Therefore, for most animals which have finished their growth, the usual rations containing good quality roughage furnish sufficient mineral matter, except common salt. As shown later, it is advisable to supply farm animals common salt in addition to that in their feed. Since large amounts of lime and phosphorus are needed to build the skeleton, these elements may fall short in rations for young animals. Also, as is pointed out later, high-producing dairy cows may sometimes be benefited by a mineral supplement furnishing calcium (lime) and phosphorus, for milk is very rich in these mineral nutrients. Over 90 per cent. of the mineral matter in the skeleton consists of calcium and phosphorus. When the supply of either of these is low in the feed, the skeleton acts as a storehouse, doling out these mineral elements so that the life processes of the body may continue normally for a time. But such withdrawal of mineral matter from the bones makes them porous and brittle. Indeed, in certain localities where the hay and other roughages are unusually low in calcium and phosphorus, due to the poverty of the soil in these elements, the bones of farm animals may become so brittle that they break with surprising ease, &c. Fortunately, roughage from the legumes, such as clover, alfalfa, and cowpea hay, is rich in phosphorus and especially in calcium, &c. When there is danger of a deficiency of either calcium or phosphorus, it is wise to add a supply to the ration. Calcium may be furnished cheaply in ground limestone or wood ashes, and both calcium and phosphorus in ground rock phosphate, ground bone, or bone ash."

The foregoing extracts denote that the fact that mineral salts in stock foods was essential was recognised, but that in later years the possibility of a shortage of these ingredients in stock foods emphasised, and within the last few years a large amount of investigational work has been conducted in different countries of the world in connection with pastures, and the mineral content of their herbage. Mention of a few only of these researches will be made here.

### Experience in Other Countries.

Theiler, Green, and du Toit (1) reported that, owing to the low phosphorus content in soils of a large area of the Union of South Africa, a relationship between phosphorus deficiency of the pastures of these areas and aphosphorosis in cattle was found. Davis (2) points out a connection between low milk supply and low percentage of phosphorus in crops and soils in the Bihar district of India. Armstrong (3) concludes that the best grazing land is always associated with soils rich in available phosphates and that inferior herbage of pasture is generally due either to the soils being deficient in available phosphates or in bad mechanical condition.

In a paper of this length it is impossible to give even a brief summary of the comprehensive work, "Investigation on the Mineral Contents of Pasture Grass and its Effect on Herbivora," by Elliott, Orr, Wood, and collaborators (4), of which five reports are already published, but one or two extracts of these reports are given below.

Elliott and Crichton (5)—"Pasture analyses show that these grave mineral deficiencies do actually occur in large pastoral areas, and that these areas are correlated with high stock death rates. The mineral elements of the ration are therefore no less important to the pastoral farmer than to any other stock feeder."

Godden (6)—"The percentage of silica-free ash in the 'not eaten' grass from the hill pastures is only approximately 50 per cent. of that in the 'eaten' grass. This deficiency is fairly uniformly distributed over the ash constituents with the possible exception of sodium."

Godden (7)—"Analytical data are recorded which indicate that the application of artificial fertilisers to grass land may result in considerable modifications in the mineral content of the herbage of these pastures. The constituents which appear to show the biggest variations are calcium and potassium and, to a lesser extent, phosphorus. Coupled with any marked increase in the calcium content of the herbage, there is generally to be found an increase in the percentage of nitrogen."

### Australian Pastures.

In connection with stock feeding in Australia it has to be recognised that there are areas of land, both on the coast and inland, that are deficient in phosphates, and also that, by a method of continuous cropping or of grazing without some means

being taken to at least maintain the phosphate content of the soil, these areas are continually being increased. It is not contended that phosphate deficiency is the sole factor in causing the breaking down of what was once good grazing land, but it is thought that such deficiency is a big factor, and at times the determining factor.

In feeding dairy cattle, the system of allowing the stock to graze upon cultivated fodder crops for a certain time and then turning the stock into grazing paddocks is becoming a somewhat usual practice in Queensland, and it is thought in other States also.

The actual determination of the amount of nutrient and mineral obtained by stock feeding in the above-mentioned way becomes a difficult problem, for, the different rates of feeding by the individual animal, and the growth of the grazing areas of both fodder and grass, whether regular or irregular, will have to be taken into consideration. If the stock are herded on a restricted area and the fodder grazed practically to the ground, a fair estimation of the food consumed will be possible. As in the case of feeding weighed rations, the financial aspect has to be considered, so also when the above method is followed the experience of the stock feeder will be called upon to decide how long to graze his stock upon any particular fodder crop to obtain the most profitable returns.

### Variation of Feeding Values—Queensland Experience.

The variation in feeding value of pasturage at different periods of growth has always had some recognition, but within the last few years more detailed determinations have been made of the nutrients existing in pasturage in different stages of growth.

Referring to the protein content of grass at different stages of growth, the following figures are extracted from Annual Report (1914), J. C. Brünich, Agricultural Chemist, Department of Agriculture, Queensland. The percentage of crude protein is calculated on water-free material, and this figure is extracted from analyses of grass samples collected as representing different stages of growth:—

<i>Paspalum dilatatum</i> (Esk District).		Flinders Grass (Cunnamulla District).	
	Crude Protein.		Crude Protein.
Young, thinly grassed, March, 1914 .. .. .	15.64	Winter, matured, August, 1913 .. .. .	4.52
Midgrowth, May, 1914 .. .. .	10.80	ditto .. .. .	3.83
Mature, March, 1914 .. .. .	6.35	Midgrowth, March, 1914 .. .. .	7.96
Midgrowth, May, 1914 .. .. .	9.93		

Mitchell Grass (Cunnamulla District).	
	Crude Protein.
Winter, mature, August, 1913 .. .. .	4.02
Midgrowth, March, 1914 .. .. .	8.76
Winter, mature, August, 1913 .. .. .	3.79
Midgrowth, March, 1914 .. .. .	7.90
Approaching maturity, May, 1914 .. .. .	5.45

Wood, Blunt, and Stewart (8) have made a very comprehensive investigation concerning the nutritive value of pasture under a system of frequent cutting resembling the conditions of close grazing. This investigation shows that when grass is kept short by grazing a high protein percentage is maintained throughout the whole season, and that, compared with grass allowed to grow until suitable for haymaking, although the hay crop yielded much more dry matter per acre, it only yielded about two thirds of the amount of digestible protein obtained in the herbage from the pasture plot. Still further, the fibre of the pasture grass was found to be much more digestible than the fibre of the hay crop, being digestible almost to the same extent as the carbohydrates. The pasture as treated favoured increased clover growth. It should also be mentioned that the soil in which the pasture was grown contained very satisfactory amounts of available phosphate and potash.

In this report it is mentioned that cutting the grass with motor mower and grazing, in certain respects, is not strictly comparable, as the mower is non-selective and animals show tendency to graze certain herbage and leave the rest to grow coarse.

The grass frequently cut as in this investigation was found to have a narrow nutritive ratio, and it is mentioned that if any supplementing is required when grass is fed in this manner, a carbohydrate and not protein concentrate should be used.

It is stated "that the results of the investigations are only applicable to such pastures as are kept short by being grazed to their fullest capacity."

The foregoing illustrations are sufficient to emphasize the fact that the protein content is higher in the younger stages of grass growth.

### **The Importance of Protein Content of Pastures.**

In Australia the fact that young pasturage has higher protein content than that of matured growth has been to some extent recognised. It has been related that a dairy farmer has fenced off his grazing area in order that the herd might graze over one paddock one day per week. The animals under such practice should, according to the illustrations mentioned, obtain more protein than if grazed on more matured grass.

The importance and necessity of a sufficiency of mineral matter in the pastures and crops eaten by animals for their healthy growth has been mentioned, but the protein content of the feed is also of the very greatest importance. The animal requires adequate quantities of the various nutrients and accessories of a feed, but this paper is dealing only with the mineral and protein content of pasturage, and a close connection exists between these substances. Clovers and cultivated legumes are characterised by having a high protein and mineral content, the last containing a high percentage of both phosphorus and calcium, especially of calcium.

### **Phosphatic and Lime Deficiency in Soils.**

As before mentioned, the soils of a large portion of our grazing areas are deficient in phosphates, and also it may be stated in some cases a deficiency in lime occurs. Therefore it naturally follows pastures growing in above-mentioned soils are deficient in legume growth, but where climatic conditions are favourable upon application of phosphatic fertilisers a good growth of clover has resulted.

It is known that by means of bacteria existing in nodules upon their roots the leguminous crops obtain their nitrogen from the air, and it is stated that leguminous growth in pasturage increases the nitrogen content of the other grasses of the pasturage.

Bear (9) writes—"As to whether any associated non-legumes are benefited by nitrogen fixed by the nodule organisms is uncertain. While the content of the nitrogen of the associated non-legume has been shown to be increased, this may be by reason of the favourable effect of the legume on nitrification."

### **Legumes in Pastures.**

In connection with this matter Murray (10), in a paper, "Meadow and Pasture," gives a very interesting explanation of the beneficial results of legume growth in pasturage. In this article it is pointed out that in the early stages of growth there is little difference in the nutritive value of the several varieties of grass, but towards maturity the digestibility of the organic matter is modified. Again, it is stated that heavy dressing of soluble nitrogenous fertilisers accelerate the formation of fibre and that phosphatic manures have a contrary effect; and experiments are quoted showing that the nutritive value of hay was depressed by the application of ammonium sulphate and that in other cases by the application of basic slag or superphosphate much more mutton was obtained from the land than where such applications were not made.

Mention is made of the acceptance of the idea that, owing to the accumulation of nitrogen in the soil by growth of clover, pastures were improved; then why should this clover-accumulated nitrogen, which it is believed must be transformed into nitrates before being utilised by other plants, be regarded as more beneficial or less harmful than nitrogen in the form of sulphate of ammonia—which in the above-mentioned experiment was not beneficial?

Murray explains this, writing as follows:—

"The key to the mystery appears to be that in pastures the clovers not only collect nitrogen, but they also regulate the supply. In a previous article (11) the author pointed out that both the quantitative and qualitative results depend not only upon the amounts, but also, to a very large extent, upon the relative proportions in which the various fertilising ingredients are present in the soil. At present only the nitrogen and phosphoric acid need be considered. Now, clovers require more phosphates than the grasses—about twice as much per acre—and any deficiency in this respect tells much more heavily against the former than against the latter, and the growth of clover is restricted. The supply of nitrogen does not

therefore increase beyond the amount of phosphates for which it is suitable. When the amount of available phosphoric acid in the soil is increased by application of phosphatic fertilisers, a marked increase in the amount of clover in the herbage almost invariably follows. The supply of nitrogen, which is necessary for the growth of grasses, is thus increased, but the quality of the fodder is not deteriorated, because the quantity of nitrogen accumulated in this way is never in excess of the amount of phosphate for which it is suitable."

### **Queensland Grasses.**

From a review of a large number of analyses of Queensland grasses which have been published in the annual reports 1909, 1912, and 1914 of J. C. Brunnich, Agricultural Chemist, the great variation of the crude protein content of these grasses cut at different stages of their growth will be very noticeable. And when stock, through one cause or another, have nothing practically to eat but the matured low protein-content grass, which at this stage will also have a very low digestion coefficient, it will follow that through protein deficiency the growth and constitution of the stock will be seriously affected.

Brunnich (12) reports protein starvation as being one of the causes of death of sheep feeding upon Mitchell grass hay containing 2.01 per cent. crude protein.

### **Factors Requiring Urgent Consideration.**

Judging then from what has been already stated in this paper and referring to stock feeding in Queensland, it would appear that mineral (phosphorus and calcium) and protein deficiency are two factors that require urgent consideration..

In the case of those stock feeders whose grazing areas are climatically suitable for a more or less continuous clover growth, the application of phosphatic fertilisers to the pasture would remedy both deficiencies.

Even when late and irregular rainfall causes a spasmodic clover growth, the nitrogen accumulated by this growth would, according to reference (10), be utilised by the non-leguminous growth. And where top dressing with phosphatic fertilisers of only restricted grazing area is considered profitable, any further requirement of mineral matter or protein must be supplied by phosphatic licks and feed stuffs with high protein content.

The unique position of clovers in the leguminous growth of pasturage is recognised, and so far they only have been mentioned, but in the greater porportion of the grazing areas of Queensland the climatic conditions are unsuitable for clover growth. It is thought therefore that there is a very large amount of investigational work to be done in connection with discovering, if possible, leguminous herbage, indigenous or imported, most suitable for the pasturage of each particular district. As before stated, the ash analyses of the legumes show that these plants require a plentiful supply of phosphorus and calcium for their growth, and it is not inferred that any legume is likely to be discovered that is exceptional in regard to the above-mentioned requirements.

As with other plants, the different legumes have root systems ranging from shallow to deep-rooted, and with the deep-rooted varieties, the roots having contact with a larger soil area, the possibility occurs of their being able to obtain more plant food than shallow-rooted varieties, and also of being more suitable to droughty conditions.

### **Central and Western Queensland Grazing Areas—Soil Analysis.**

From analyses made in the Queensland Agricultural Chemical Laboratory of soils from the Central and Western grazing areas, it is seen that there is very marked deficiency in phosphorus combined with, as a general rule, good calcium and potash content. It is thought then one important factor causing the very high mortality in lambing, which has become more apparent in latter years, in certain grazing areas is the gradual depletion of available phosphates in the soils of these areas; the constitution of the ewes being weakened by an insufficient amount of mineral matter and protein in their feed.

The principal grass of the pasturage, owing to insufficient phosphorus, grows to maturity rapidly, and is therefore liable to contain a relatively low amount of digestible nutrients, as illustrated in (10).

Also, owing to the want of any soil plant food there is the probability of change in the botanical composition of the edible herbs and shrubs of a pasturage occurring, resulting in a less nutritive growth becoming established.

### The Value of Suitable Stock Licks.

With stock grazing on such country the use of phosphatic licks, together with top dressing with phosphatic fertilisers (effecting an increased legume growth), at least some paddocks to be used for sick and stud stock, will undoubtedly improve the constitution of the stock, and lower the high mortality.

The gradual exhaustion of the soil phosphates may have caused the lowering of the legume content of the herbage, and when consideration is given to the fact that stock show instinctive preference in grazing legume growth, it is possible for such growth to have been entirely depleted, and in such cases, even with top dressing, it is thought quicker and more profitable results would be obtained by planting suitable legumes in the herbage.

In Queensland some stockowners have followed the recommendation of the Agricultural Chemist, J. C. Brunnich, and have supplied their stock with a lick composed mainly of Nauru phosphate with salt, and reports have been received stating the very beneficial results obtained by using such licks.

That recognition of the value of phosphatic licks is taking place is evidenced by the statement of one Brisbane firm that within the last fifteen months 460 tons of Nauru phosphate have been sold to stockowners for purposes of stock lick; also, prepared phosphatic licks are now upon the market.

It is to be hoped the demand for Nauru phosphate rock, both for fertiliser and lick purposes, will ultimately be large enough to allow the landing and grinding of this rock to be a commercial undertaking in Queensland, thus allowing the ground rock to be sold at a lower price.

### Conclusion.

This paper has been concerned with only phosphate and protein deficiency in stock feed; that deficiency in other constituents of feed may cause serious trouble is recognised.

The very comprehensive programme of investigational work upon the subject of Animal Nutrition in the Commonwealth, as outlined by Professor T. Brailsford Robertson in "The Journal for Scientific and Industrial Research," vol. I., No. 1., will yield, in its accomplishment, information of the greatest importance both to the investigator in animal nutrition and the stock feeder.

- (1) Theiler, Green, and du Toit, J. Dep. Agric., S. Africa, May, 1924.
- (2) Davis, Agric. J. of India, 22-77.
- (3) Armstrong, J. Agric. Sci., 7-283.
- (4) J. Agri. Sci., 16, Part 1.
- (5) Elliot and Crichton, J. Agric. Sci., 16-65.
- (6) Godden, J. Agric. Sci., 16-78.
- (7) Godden, J. Agric. Sci., 16-98.
- (8) Woodman, Blunt, and Stewart, J. Agric. Sci., 16-205 and 17-209.
- (9) Bear, Soil Management, 1924.
- (10) Murray, "Fertilisers and Feeding Stuffs Journal," vol. xi., 1926, p. 85.
- (11) Murray, "Fertilisers and Feeding Stuffs Journal," vol. ix., No. 21.
- (12) Brunnich, "Queensland Agric. Journal," March, 1926.

### "A MOST USEFUL JOURNAL."

*A Gympie farmer writes—*

*"It gives me great pleasure to renew my subscription to a most useful Journal. No farmer should be without it. During the year I have recommended it to some of my neighbours, who did not even know such Journal was in existence. In one instance I was given a subscription to send at once for it. This farmer is very pleased with it, the only thing he is sorry about is that he had not heard of it before. Wishing the Journal that success which it deserves."*

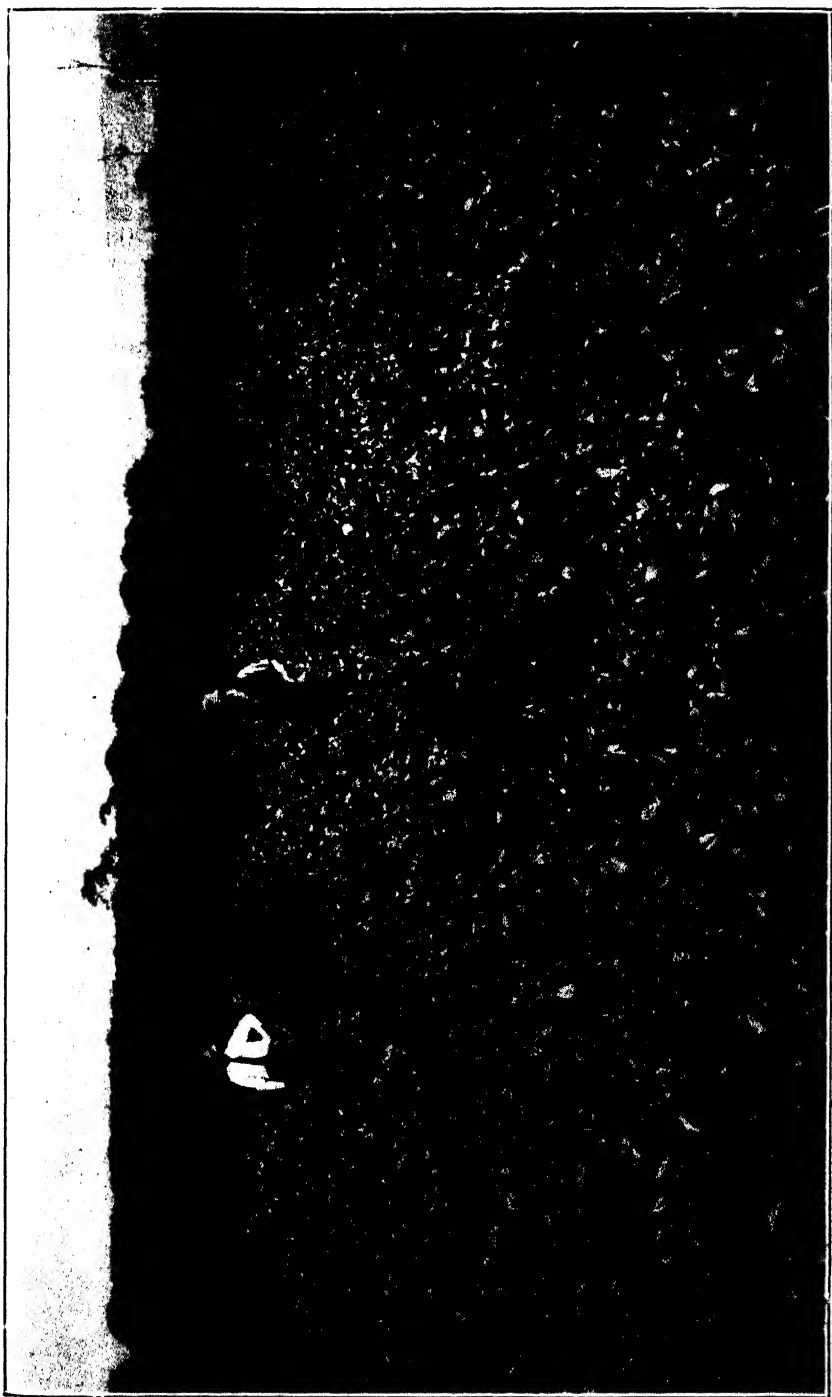


PLATE 7.—A GREEN MANURING CROP (COWPEA) AT PALMWOODS.

## THE PRINCIPLES OF BEE-KEEPING.

### FEEDING AND BREEDING FOR SPECIAL PURPOSES.

By RUPERT HOLMES, Poultry and Bee Instructor, Queensland Agricultural College, Gatton.

It is important that the beginner should clearly understand the principles underlying successful bee-keeping. A colony of bees consists of fertile queen, a large number of worker bees, and during summer a certain proportion of drones (males), together with their combs and brood. The strength of a healthy colony depends on the vigour and laying power of the queen, who is at her best in her second season. A queen hatched in October 1924, will be at her best in September 1925. She should be replaced by a young one in 1926 by requeening. Queens may either be purchased, or be raised by different methods, which will be described later. The economy of a hive depends on (1) the generation of sufficient warmth in the brood nest (by means of the heat from the bodies of the clustering bees) to such a point as will stimulate the production of eggs and enable the young

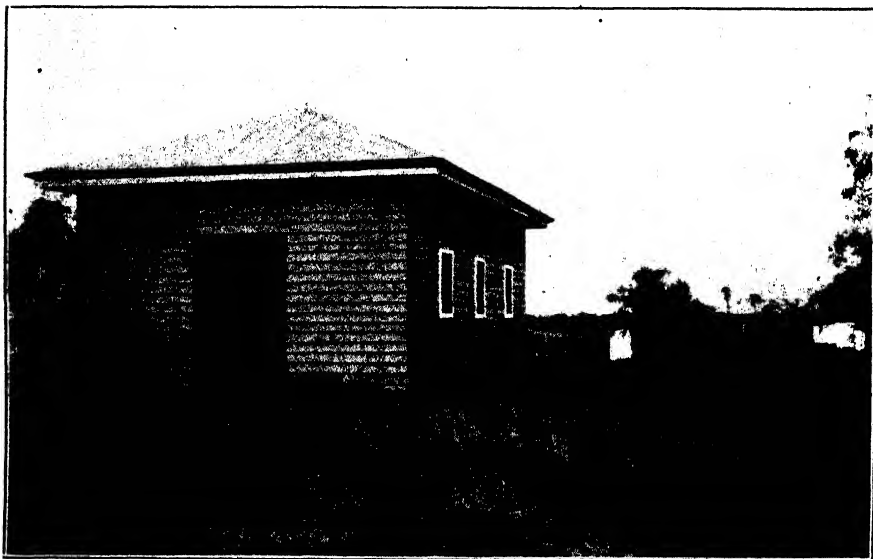


PLATE 8.—HONEY HOUSE, QUEENSLAND AGRICULTURAL COLLEGE, GATTON.

bees to be reared; (2) the nursing of the larvæ and the cleansing of the cells for the queen to lay in; (3) the collection of the pollen, water, and nectar for food; (4) the building of storage comb; and the collection of nectar for future supplies of honey. The first three of these conditions must be fulfilled before the last can begin; it is, therefore, only by means of a large and vigorous surplus population that a colony can gather enough stores for its future use, and provide surplus honey for the bee-keeper. The aim of the bee-keeper is to keep his colonies strong; weak colonies are always unprofitable.

#### Colonies for Wintering.

Many bee-keepers make the mistake of attempting to winter colonies by artificial increase. Colonies that for various reasons have become reduced in numbers are in such a weak condition that they often do not survive the cold weather, or the long confinement in the hive during the winter. In order to avoid failure increase should be made early in the season so that by the end of February at least four combs are filled with brood and well covered by bees. The colonies must then be built up during March and April until they are sufficiently strong to winter successfully. Colonies covering less than four combs at the end of February should be united to form stronger ones. After selecting two or more weak colonies for union move

them gradually together. Allow them to remain two days in this position and then in the evening of the second day unite them in one hive.

This is carried out as follows:—First remove all combs in each colony which are not covered with bees. Then, after selecting and caging the better queen in the permanent hive remove the other queen or queens. The bee-covered combs are placed in this permanent hive. The empty hive or hives are then removed. The operation is completed by releasing the caged queen forty-eight hours after the colonies have been united. The process of building up is carried out by gradual addition of frames fitted with full sheets of foundation and in this way the strength of the colonies increases.

### Feeding to Increase Brood Rearing.

In most districts few nectar yielding flowers are in bloom after March onward, and only a small quantity of natural food can, therefore, be collected by the bees. It is most necessary, therefore, in such districts, to supplement the natural food supply by feeding with syrup. This syrup must always be fed at this time of the year through a slow feeder, giving just sufficient for the purpose, otherwise, if a rapid feeder is used, the bees will store the surplus syrup in the cells. Syrup for feeding can be made from ordinary white cane sugar by dissolving each pound of sugar in half a pint of water by heating over the fire, in order to prevent robbing the entrance to the hives must not be wider than  $\frac{1}{2}$  in. during the whole of the time feeding is taking place, and the syrup, which should be warmed, must be given late in the evening.

### Feeding Candy.

If it is doubtful whether the supply of food contained in the combs is sufficient to carry the bees through to the following spring then feed candy. A cake of candy should be placed over the brood nest, and the candy supply should be renewed from time to time if required. Candy can be prepared as follows:—In a clean pan there should be placed three pounds of white sugar, half a pint of water, and as much cream of tartar as can be heaped on a sixpenny piece. The pan should be stood beside the fire, stirred occasionally until the sugar is dissolved, and then placed on the fire and stirred continually. When it has been boiling two minutes the pan should be removed and placed in cold water, until the sugar begins to cloud. The mixture should then be stirred well, and poured into saucers lined with paper and allowed to cool.

### Pollen Substitutes.

This naturally brings us to a consideration of pollen shortages. Honey is the heat and energy forming portion of the bee's diet, and if in the protein footstuff pollen is missing or deficient, the young larva must suffer. Pollen under analysis contains ingredients similar to pea-flour. Bees, when pushed, will accept a number of substances such as flour (wheaten or rye) or oatmeal. A good plan is to place a number of flat trays containing flour about the apiary. The bees carry the flour to the hive. I have had success by mixing pea-meal with a pinch of salt, and working it into a thick paste with honey. The paste is plastered on to an empty comb, giving it directly to the brood nest. Most hives in winter have no brood or eggs, and this is to be preferred when no natural pollen is available in the late autumn.

Taking a normal season on early spring about the end of August, all colonies should be overhauled to see they are not short of food. Food in this case means honey and pollen. If there is a shortage I would suggest the pea-meal mixture with honey and salt worked into a stiff batter with 5 per cent. white of egg. Take a table knife and press the batter into an empty comb, which should then be given to the bees, on the outside of the brood nest.

### A CREDITABLE PUBLICATION.

Thus a Kilcoy farmer—

"I enclose herewith a postal note for 3s., being subscription for another three years to your fine Journal. As a publication it is a credit to the Editor and staff, the Department of Agriculture, and the State of Queensland. Wishing the Agricultural Journal the continued success it deserves."

# RAINFALL IN THE AGRICULTURAL DISTRICTS.

TABLE SHOWING THE AVERAGE RAINFALL FOR THE MONTH OF MAY, 1928 IN THE AGRICULTURAL DISTRICTS, TOGETHER WITH TOTAL RAINFALL DURING MAY 1928 AND 1927 FOR COMPARISON.

Divisions and Stations.	AVERAGE RAINFALL.		TOTAL RAINFALL.		Divisions and Stations.	AVERAGE RAINFALL.		TOTAL RAINFALL.	
	May.	No. of Years' Records.	May, 1928.	May, 1927.		May.	No. of Years' Records.	May, 1928.	May, 1927.
<i>North Coast.</i>					<i>South Coast—continued:</i>				
Atherton ...	In.		In.	In.	Nambour ...	In.		In.	In.
Cairns ...	1.98	26	1.03	0.84	Nanango ...	5.02	31	2.97	0.06
Cardwell ...	4.49	45	2.38	1.10	Rockhampton ...	1.55	45	0.94	0
Cooktown ...	3.57	55	1.74	0.26	Woodford ...	1.50	40	0.11	0.09
Herberton ...	2.98	51	0.62	0.45		2.95	40	2.57	0
Ingham ...	1.64	40	0.54	0.58	<i>Darling Downs.</i>				
Innisfail ...	3.42	31	1.17	1.58	Dalby ...	1.34	57	0.88	0
Mossman ...	12.34	46	9.07	9.82	Emu Vale ...	1.17	31	0.64	0
Townsville ...	3.69	14	1.37	1.12	Jimbour ...	1.23	39	1.43	0
	1.33	56	0	0.03	Miles ...	1.55	42	0.74	0
<i>Central Coast.</i>					Stanthorpe ...	1.91	54	1.38	0.14
Ayr ...	1.13	40	0	0.03	Toowoomba ...	2.22	55	1.79	0.08
Bowen ...	1.30	56	0.06	0.11	Warwick ...	1.57	62	0.95	0
Charters Towers ...	0.78	43	0	0	<i>Maranoa.</i>				
Mackay ...	3.81	56	2.43	0.59	Roma ...	1.48	53	0.40	0.06
Proserpine ...	4.63	24	1.23	0.48	<i>State Farms, &amp;c.</i>				
St. Lawrence ...	1.80	56	0.19	0.08	Bungewongorai ...	0.59	12	0.42	0.04
<i>South Coast.</i>					Gatton College ...	1.70	27	1.36	0.03
Biggenden ...	1.82	28	1.71	0.13	Gindie ...	0.99	27	0	0
Bundaberg ...	2.76	44	0.86	0.13	Hermitage ...	1.26	20	0.65	0
Brisbane ...	2.80	77	1.82	0.02	Kairi ...	1.99	12	1.52	...
Caboolture ...	2.92	40	1.67	0	Sugar Experiment Station, Mackay	3.44	29	2.03	1.13
Childers ...	2.25	32	0.98	0.10	Warren ...	0.95	12	...	0
Crohamhurst ...	4.92	35	4.12	0.12					
Esk ...	2.03	40	2.19	0.02					
Gayndah ...	1.57	56	0.09	0					
Gympie ...	2.96	57	2.14	0.16					
Kilkivan ...	1.89	48	0.82	0.11					
Maryborough ...	3.18	55	1.16	0.12					

NOTE.—The averages have been compiled from official data during the periods indicated; but the totals for May this year, and for the same period of 1927, having been compiled from telegraphic reports, are subject to revision.

GEORGE G. BOND,

Divisional Meteorologist.

If you like the "Journal," kindly bring it under the notice of your neighbours who are not already subscribers. To farmers it is free and the annual charge of one shilling is merely to cover postage for the twelve months.

## SHEEP IN THE WHEATGROWING PROGRAMME.

The value of fallowing is now recognised by all capable farmers. Fallowing, however, can only give the best returns when combined with sheep, and it actually provides the opportunity for keeping sheep. Where fallowing is not practised the straw is burnt off, and the land is ploughed for the succeeding crop; but under a fallowing system it is not necessary to burn the straw, for the stubble can be grazed with sheep six or seven months after harvest. A great deal of the straw is eaten and the balance is broken and tramped into the ground, and is generally put into such a state that it can be ploughed under easily without the texture of the land being interfered with.

In the old world great value is attached to farmyard manure, the basis of which is straw. It is not yet possible, in this country of high labour costs, to adopt reaping and threshing and the production of farmyard manure for the maintenance of soil fertility. The grazing of sheep on the straw and the ploughing under of the residues, however, is a very fair substitute, and has the advantage, which appeals to all of us, of being applicable at no outlay for labour. If, however, the crop is infected with disease such as flag smut, foot rot, or take-all, then the wisest plan is to burn the stubble early, cultivate the land, and sow an early crop of oats to provide feed.

A very undesirable feature of farming in our wheat districts is its one-crop nature. Such a system tends to deplete the fertility of the land and to encourage weeds and diseases. Some of these—wild oats among the weeds and take-all among the diseases—levy heavy toll upon our crops, and the only practicable method of dealing with them is by rotation. In practically all the wheat districts wheat is the only salable crop which can be raised; but oats, barley, Sudan grass, and others can be grown as fodder crops and can be turned to account by means of sheep. By the use, therefore, of sheep, we can apply one of the great principles of good farming—rotation of crops.—“A. & P.” Notes, N.S.W., Dept. Ag.

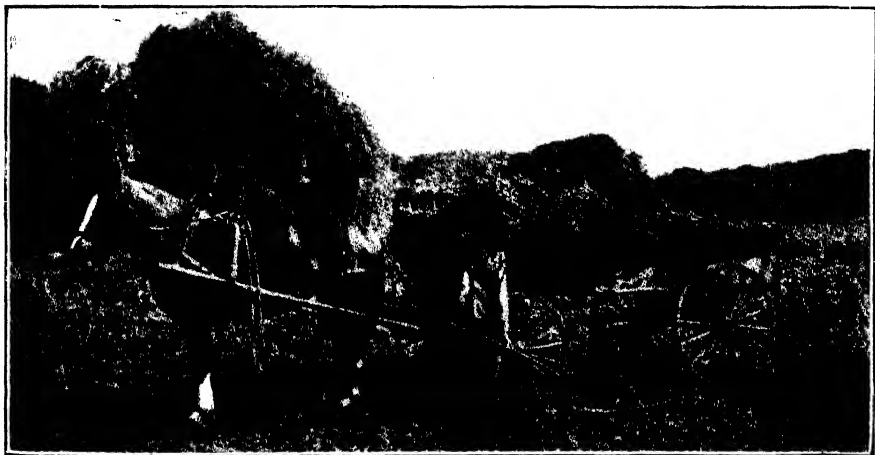


PLATE 9.—CUTTING AND CARTING GREENSTUFF TO PIGS

This may be even a better proposition than grazing during very moist seasons when the ground is soft. There are occasions, too, when it pays better to cut and cart lucerne than to allow pigs to graze on the crop. This farmer is gathering the daily supply for his brood sows and young stock.

## **PIG FARMERS' SCHOOL AT GATTON.**

### **A Comprehensive Programme.**

Queensland's first pig farmers' school was held at the Queensland Agricultural High School and College at Gatton during the middle weeks of June. The school revealed a new phase of usefulness of the College and its excellent service to the rural industries of the State. It was the outcome of a suggestion by Mr. E. J. Shelton, Instructor in Pig Raising of the Department of Agriculture and Stock, and is the first school which has resulted from a full co-ordination between that branch of the service and the Department of Public Instruction. Professor J. K. Murray, Principal of the College, who also holds the Chair of Agriculture at the Queensland University, and Mr. Shelton organised the course on lines similar to the successful annual tractor and dairy schools conducted at the College. Lectures and practical demonstrations were given daily by members of the College staff and instructors of the Agricultural Department.

Farmers and farmers' sons from the South Coast, Darling Downs, and from the North beyond Mackay made up the personnel of the school. The enrolment was not quite as large as expected, but in the circumstances this was rather an advantage, for while the College is in ordinary session accommodation is limited. As it was classrooms had to be turned into temporary dormitories.

### **A Practical Programme.**

Each forenoon was devoted to lectures for which there were three daily sessions, commencing at 8 a.m. The afternoons were taken up with practical demonstrations in the piggeries. Prior to the regular evening session a question period, from 7 p.m. to 7.45 p.m., was fixed. Inquiries into all phases of farm work were invited, and these were answered by the instructors. For the night gatherings a course of special lectures on general subjects was provided. During the currency of the school special visits to the bacon factories at Oxley (Foggitt, Jones, Limited) and Murarrie (Queensland Co-operative Bacon Company) were arranged, and this proved one of the most important and instructive features of the school. Every assistance and sympathy was forthcoming from the managements of the several bacon factories, from which samples of excellent foodstuffs were supplied to the school without charge. The benefit of bringing the farmers into closer contact with the factories and impressing them with their requirements, so that the work of developing the industry might be co-ordinated and continuous from breeding to ultimate market disposal of the product, was appreciated by all.

Visits to some of the larger piggeries near Brisbane were also arranged.

### **The Lecture Syllabus.**

Lectures listed as follow were delivered in the course of the school:—

Breeding, Feeding, and the Characteristics of the several families of Pigs: Mr. E. J. Shelton.

Principles of Feeding and Microbiology: Professor J. K. Murray.

Animal Husbandry: Mr. A. J. McKenzie.

Fodder Crops for Pigs: Professor J. K. Murray and Messrs. A. J. McKenzie and T. Graham.

Marketing Methods and Problems: Mr. J. A. Heading, Chairman of Directors, Queensland Co-operative Bacon Factory.

Pig Hygiene: Mr. H. G. Cheeseman, Department of Agriculture and Stock.

Pure Breeders' Societies: Mr. J. H. Whittaker, President of the Pure Breeders' Society.

Pig Club Organisation: Mr. A. G. Aitchison, Department of Public Instruction.

The Pig Industry: Mr. R. S. Maynard, Editor "Live Stock Bulletin."

Biology: Professor E. J. Goddard, Dean of Faculty of Agriculture, Queensland University.

Agricultural Education: Professor J. K. Murray.

The Value of Publicity to the Pig Industry: Mr. J. F. F. Reid, Editor of Publications, Department of Agriculture and Stock.

Overseas Experiences in the Bacon Trade: Mr. G. Setch.

Bacteriology: Mr. C. Pound, Government Bacteriologist.

Commercial Pig Farming: Messrs. R. G. Watson and C. H. Jamieson, and Staff Captain Alexander, of the Salvation Army Boys' Home, Riverview.

Show Preparation of Pigs: Mr. Howies, Royal National Agricultural Society.

Lectures on General Subjects: Mr. E. J. Dunlop, Department of Public Instruction.

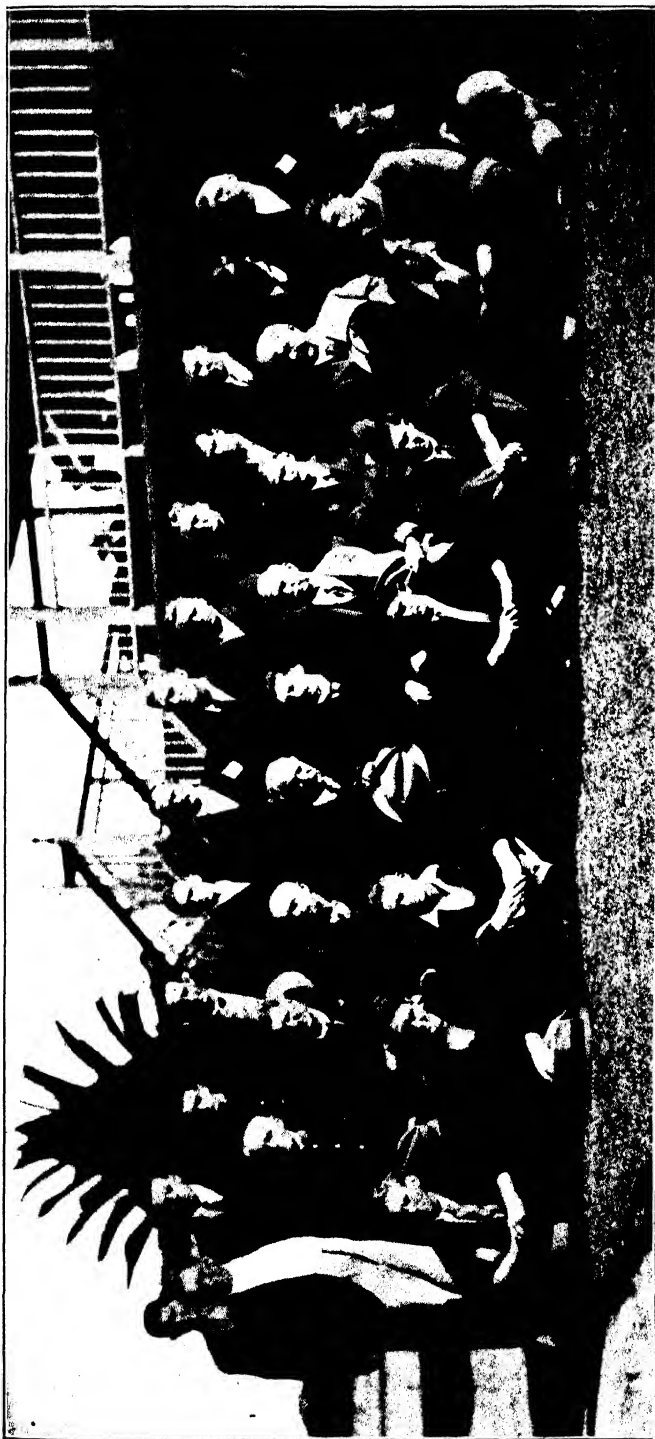


PLATE 10.—FARMERS' PIG SCHOOL AT THE QUEENSLAND AGRICULTURAL HIGH SCHOOL AND COLLEGE, GATTON, JUNE, 1928.

FRONT ROW—*Left to Right*—Geo. Handley (Murphy's Creek), A "Riverview" Student, R. Johnston (Kingaroy), L. Skerman (Brisbane), Douglas Wells (Kureelpa), Noel Harding (Flaxton), Duncan Stevens (College), W. P. Hamon (College).

SECOND ROW—H. West (North Tambourine), Staff Captain Alexander ("Riverview"). H. J. McKenzie (College), Instructor Animal Husbandry, W. F. Muspratt (Littlemore, Boyne Valley), Ernest Baynes (Royal National), Professor J. K. Murray, J. P. Bottomley (Treasurer, Royal National), E. J. Shelton, J. Bain (Secretary, Royal National).

BACK ROW—C. Dunstan (Mount Sampson), L. A. Downey (Assistant Instructor), Captain Hunter ("Riverview"), P. N. Campbell (Lamington), H. Curtis (North Tambourine), Alf. Hanson (Jinghi Gully, Jandowae), M. Brosnan (Clifton), J. Stephens (Withcott, Toowoomba), T. Stephens (Withcott, Toowoomba), G. Hudson (Mackay), J. Schneider (Boonah), S. Whittaker (Casino, N.S.W.), W. Puschmann (Jandowae).

### Field Demonstrations.

Practical field demonstrations in every phase of animal husbandry relating to pig raising were an important daily activity of the school, and in these the Principal, Professor Murray, Messrs. Shelton and McKenzie were assisted by Messrs. A. Severns and H. Noble of the College staff. The senior students of the College also attended all lectures and demonstrations.

The farmers attending the school elected a committee to assist in its management, consisting of Messrs. W. E. Muspratt, Boyne Valley (Chairman); M. J. Brosnan, Clifton; and A. A. Hanson, Jandowae. The spirit and camaraderie of the school was excellent, and speaking in appreciation of the course Mr. Muspratt said: "Most farmers are like us—they have pigs because they have cows, and they are working in the dark as far as the pigs are concerned. We want to know how to get something which will give us the quickest return and give what the bacon factories want, to get in the £ s. d. for our pigs. We consider ourselves very lucky to be able to get the chance this school gives us to learn what we need to know."

The school was run very inexpensively for the students. The total cost of board and tuition for the two weeks, exclusive of fares and the cost of the factory trips, was £2 13s. 6d.

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### CARE AND HANDLING OF PIGS.

A special notice, as set out hereunder, has been issued to pig farmers, carriers, loading agents, and officials:—

Queensland bacon-curers affirm that the pig farmers of this State suffer loss to the extent of thousands of pounds sterling annually through careless handling of live pigs in transit to market. This is the result of excessive bruising and damage, deaths in transit, &c.

Your attention is specially drawn to the following general recommendations:—

Remember that the great demand now is for prime light to medium weight fleshy bacon pigs.

See that your pigs are properly fed and "topped up" on grain food for several weeks before marketing.

Give your pigs ample exercise during the growing and "topping up" stages. Do not keep your pigs closely confined in small sties, as this is conducive to overfatness and to soft, flabby fat.

Allow your pigs clean drinking water at all times, and provide shade and protection from the effects of the weather.

Be careful to market at correct weight; you should weigh your pigs regularly and accustom them to being handled and driven. Ask your factory for their current schedule of weights and prices.

Avoid beating the pigs with whips, rods, or sticks; every time you strike them you inflict a bruise which reduces the animals' value.

Do not feed your pigs on the morning of despatch (they travel better on an empty stomach), but provide plenty of clean water.

Co-operate with your neighbours in arranging assistance at sale and trucking time.

Firebrand your pigs with your registered firebrand. Ear marks and ear tags have not proved satisfactory; the factories prefer firebranding.

Be certain that the factory receives early advice *re* your consignment, the numbers, grade, brand, mark, and time and date loaded. Hand a written statement to the buyer or official loading agent.

Co-operate with the Railway Department and the factories in their endeavours to deliver your pigs at destination in the best condition possible.

Use purebred boars only and sows of the best breeding you can obtain in producing your pigs, and buy store pigs only from reliable sources.

Help us to help you succeed in the industry.

Write to the Department of Agriculture and Stock, Brisbane, for all available information on the subject of pig-raising.

Issued under the authority of the Department of Agriculture and Stock, Brisbane, Queensland, 1928.

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***HEENZO should be used in every home.***

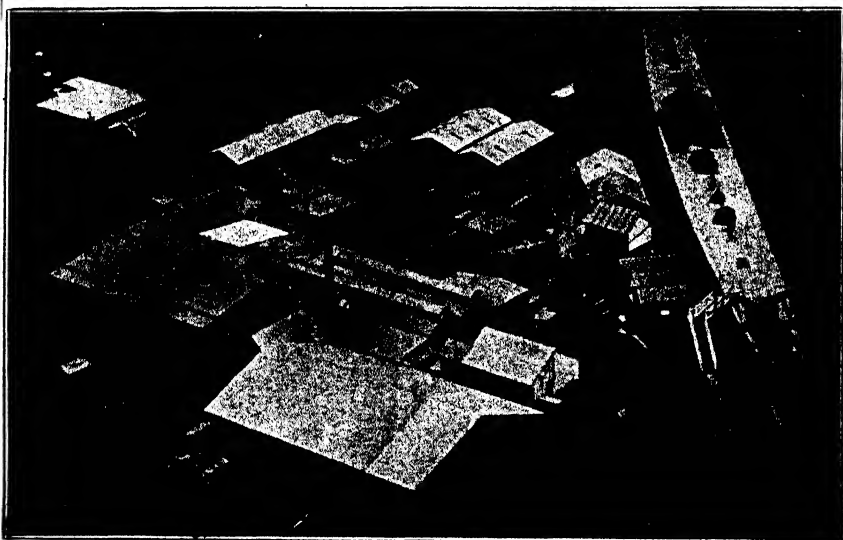
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## PIG HYGIENE.

By H. G. CHEESEMAN, Senior Slaughtering Inspector.

From a paper read before the Pig Raisers' School at the Queensland Agricultural College, Gatton, on 15th June, 1928.

I might state that when my esteemed and enthusiastic friend, Mr. Shelton, invited me to assist in filling part of this programme by reading a paper before you, I really accepted the invitation reluctantly, realising that I had nothing very new or valuable to impart. Therefore, permit me to say if I can cause someone to reflect and put into practice the things which we already know, my effort will not be in vain.

Close association with meat inspection and piggeries for the past thirty years enables me to speak with some knowledge of the life and habit of the short-lived pig from its birth to its appearance on the table in various food forms. As we have all been taught, the pig belongs to the order mammalia, species pachydermata, or otherwise thick-skinned animal. Briefly, the generic characters of the domesticated animal are small head, ears short, thin, and sharp, neck full and broad, cheek full, flexible and short snout flattened in front, small and quick eyes, mouth small, strongly built body, uniform in line carrying a wealth of condition, short twisted tail well set, four toed, short legged, and full ham.

The wild pig has different characteristics, namely, long legs, long neck and snout, long narrow roach back, thin hams, carcass generally spare of flesh, eats ravenously, and develops big belly and lives on carrion offal.

According to design and nature the dentition of the pig varies considerably; at nine months he shows 40 teeth, and at eighteen months a full mouth of 44. In order, the teeth are divided into incisors or nippers, canine or eye-teeth, molars or grinders. Therefore, from the number and position of the teeth, physiologists are enabled to define their nature and functions, as they are always intimately related to the food and habit of the animal. They form, for the same reason, important guides to the naturalist in classification of animals. Thus the domestic pig can be classed as much a grinder as a biter, for he can as well live on vegetable as animal food, although a mixture of both is economically sound, which has been decided as the most natural.

From this description the pig may be regarded as a link between the herbivorous and carnivorous tribe, and is consequently known as an omnivorous quadruped; or, in other words, an animal capable of converting any kind of foodstuff into nutriment.

### Characteristics of the Pig.

Physiologists and naturalists are all agreed that the functional characteristics of the pig are the same in whatever part of the world he may be found—he is known for his gluttony and indifference to the character and quality of his food. Occasionally he shows an epicure's relish for a succulent root, pumpkin, or other vegetable. He will the next moment turn with equal gusto to some unsavory offal, sour swill, or even liquid and stagnant filth from wallow holes in and about his lair, or in other words, will endeavour to convert any kind of aliment, good or bad, into supposed nutriment. Hence, from his coarse and repulsive mode of feeding, slothful habits, laziness and indulgence in sleep, he has gained for himself the unenviable name of being an unclean animal. The question arises "why?" Well, the answer is simply because the unfortunate animal is the victim of circumstances, brought about by the indifference of his keeper. Consequently, it is only reasonable to suppose that under such influence he is particularly susceptible to disease, saying nothing of other ailments of a dietetic nature, and which set up derangement of the alimentary canal.

Now, as filth defiles physically the characteristics of the flesh or meat, it behoves those whose livelihood it is to depend upon pig-raising to consider the seriousness of violating the law of nature, for it rests with man to counteract the evil consequences of some of his habits which the animal is unable to teach himself.

It is a remarkable fact that, though everyone who keeps a pig knows how prone he is to disease or other ailment which injures the quality and wholesomeness of the meat or flesh, yet very few have judgment to act on what they see and provide against it by strict attention to his diet, housing, and general welfare.

By strict attention to diet particularly is meant the thorough cooking or sterilising of all flesh food such as offals from slaughter-houses, skimmed and separated milk from dairies, butter and cheese factories, scraps of cooked animal substances, and boiled vegetables, bread and other aliment cast from banquets and possibly plates of sick and ailing individuals. The lastmentioned is most necessary and the old adage "Prevention is better than cure" always stands good, for it is known, for instance, that the pig is most susceptible to tuberculosis. We also know that there are many individuals in our midst suffering from that dread disease, and experimentalists have shown the possibility of infection from human beings. In nearly every case the pig is infected by ingestion, thus it will be seen how easily he might become infected if care is not exercised in the systematic selection and proper boiling of all foodstuff.

### **Tuberculosis in Pigs.**

It is quite common knowledge that tuberculosis in the pig develops rapidly without showing any external symptoms. The disease can only be definitely detected upon slaughter. Anyway the disease is always the same from whatever cause. Though subject to disease, no domestic animal is more easily kept in health, cleanliness, and comfort. By comfort is meant that his sleeping quarters should be perfectly dry and well sheltered from all changes of the weather. He should have a nice cosy bed to burrow in; moreover, under cover in his sty, there should always be a trough full of clean drinking water. The trough should be so arranged as to prevent the animal from immersing his body or standing in it, or otherwise fouling it. Clean water is most essential to a pig, saying nothing of a shovelful or two of charcoal, some lime, brimstone, Epsom salts or other medicinal agent, which are necessary to correct physical disorders caused by his artificial existence.

### **The Pig's Economic Value.**

As you all must know, habit blunts the sensibilities of most of us; and men are not naturally cruel. Still, I am a believer that there are some among us who never realise the fact that the brute beast can be made to suffer quite unnecessarily. What would happen if a pig had a voice to tell its sufferings and needs? I am afraid that many of us could not listen without feeling a twinge of conscience.

There is no domestic animal so profitable or so useful to mankind as the pig. Its value per pound exceeds that of all other flesh-giving animals.

### **Meat Inspection.**

Meat inspection is of great national importance to a meat-eating community such as we are in Australia, especially as our daily bill-of-fare is made up largely from the flesh of the ox, sheep, or pig. Therefore, it is only reasonable to expect that the great mass of consumers—the general public, for they are the most interested in the matter—should have some sort of guarantee that the flesh they do eat is perfectly free from disease.

Meat eating people throughout the whole world recognise the necessity and importance of inspection of their meat and other food products.

### **Diseases of the Pig.**

Tuberculosis is commonly spoken of as "T.B.," technically it means "Tubercle Bacilli." We are told that tuberculosis is a specific bacterial disease, and above all the most widely distributed of all contagious diseases, saying nothing of its being the most universally dangerous and deadly to man and animal. Of the latter, swine, according to statistics, are first among its victims.

Speaking generally, I have endeavoured to show how easily a pig might become tuberculous when fed on material rich in tubercle bacilli. Apart from such mechanism of infection, a tuberculous sow may infect all its young when its teats are contaminated or otherwise infiltrated by tuberculous deposits. We are also told that infection by the respiratory tract is certainly possible, but rare owing to the

fact that affected animals are usually slaughtered before the softening of the pulmonary lesions have time to disseminate the virulent matter.

The disease can only be definitely detected upon slaughter, that being so, the inspector has no difficulty in locating the presence of the disease, that is, as far as the naked eye is concerned.

More often the glands of the head are affected than the body, which accounts for the greater number condemned. Times out of number the question is raised, "Why condemn the head and not the body?" It may be explained this way. The pig mainly breathes through his mouth where straying germs of disease gain an entrance which are absorbed by the delicate membranes of the mouth, tongue, and tonsils, resulting in the fact that the glands draining the part act as fortresses against further invasion of the body. It then only remains a matter of time when they may be overcome by the enemy, thus the barrier being broken down the germ has a clear passage along the ducts into the next lymphatic vessels. It therefore will be understood that if only a speck of disease is found elsewhere in the carcass, it involves seizure of the whole body.

Often a recommendation of the Royal Commission on Tuberculosis in 1898 is cited, which reads: "In view of the greater tendency to generalisation of tuberculosis in the pig, we consider that the presence of tubercular deposits in any degree should involve seizure of the whole carcass and of organs."

This rule, of course, is not carried out in the case where the head is only affected.

Another feature of the disease, from an inspection point of view, lies in the fact that it is seldom met with in the flesh or bones of the pig, mainly confining itself to the lymphatics and delicate linings of the chest and abdominal cavity and organs. The glands, or kernels as they are commonly called, play an important part in meat inspection. It is from them the inspector gets the first indication of the presence of disease. The normal condition and colour of a gland is moderately small, somewhat firm, and on cutting exudes moisture (lymph) the colour of—in fact it resembles—common yellow soap.

The most accessible glands are the sub-maxillary and cervicals of the head and neck, dorsal (back), renal (loin), inguinal or mammary, and the iliac. Of the visceral glandular organs lungs, liver, and mesentery, &c., are all more or less subject to disease.

With regard to condemnation for parasitical infestations, very rarely is a pig totally condemned. The only parasite of any consequence is the kidney worm known as the "*Stephanurus dentatus*." Very little is known about it other than it is very destructive and will sooner or later cause economic losses if the pig farmer does not attend strictly to the laws of sanitation.

The worm itself varies in size, being a thick, round, and mottled specimen and is found abundantly in the kidney region and in other portions of the body. The presence of the worm gives rise to cysts and abscess formation containing pus-producing organisms and eggs of the parasite. They are also found in the ureter; from whence they pass out with the urine. Old sows and boars are very subject to the parasite, and no doubt are the cause of all the trouble in younger pigs. Pigs during life show no evidence of the infestation, unless they are old sows. From my experience the complaint is more pronounced in cold weather than hot.

The conditions which are most favourable for the infestation of the kidney worm are filthy wallows, insanitary feeding and watering places, especially where large numbers of pigs are kept year after year on a small area. Veterinarians tell us there is no reliable method of dealing with the trouble other than thorough sanitation. That being so, the pig farmer must then seriously consider the matter of changing his sties and yards every year or so to fresh ground, and planting a crop before using the piggery again for pigs. In any case, pig yards should be selected with a view to securing proper drainage, cleanliness, and sanitation. They must also be as free as possible from the common type of mud wallow, which soon becomes a reservoir of concentrated filth and bacteria.

In conclusion, I would plead for the pig's welfare and comfort, and again stress the fact that much disease and other disorders are due to insanitary feeding and unclean drinking troughs in which the pigs are able to place their feet which carry filth direct from the floor of the sty.

## Answers to Correspondents.

### Seaweed as Fertiliser.

A.G.B. (Townsville)—

The Agricultural Chemist, Mr. J. C. Brünnich, advises as follows:—

Seaweeds contain from three-tenths to 1 per cent. of nitrogen, one-tenth to  $\frac{1}{2}$  per cent. of phosphoric acid, and  $\frac{1}{2}$  to 2 per cent. of potash. When burnt the nitrogen is lost.

Charcoal has practically no manurial value, but will sweeten the soil.

Coral sand is practically pure lime carbonate and contains only a small trace of phosphoric acid.

Sawdust contains from  $\frac{1}{2}$  to 1 per cent. of nitrogen, practically no phosphoric acid, and one-tenth per cent. of potash and a little lime.

Fish manure contains from 3 to 5 per cent. of nitrogen, and from 3 to 8 per cent. of phosphoric acid, and is a valuable fertiliser.

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### FRUIT CULTURE.

*Selected from the outgoing mail of the Director of Fruit Culture, Mr. Geo. Williams:—*

### Papaw—Sex Determination.

C.P. (Eel Creek)—

There is no reasonably certain method of distinguishing the male from the female papaw. It is found, however, that the most vigorous seedling plants are generally males, and should be discarded in favour of those of weaker growth.

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### BOTANY.

*Selected from the outward correspondence of the Government Botanist, Mr. C. T. White, F.L.S.*

### Phasemy Bean.

J.G. (Boonah)—

The specimen is *Phaseolus semierectus*—the Phasemy Bean, a native of tropical America now widely distributed over the warmer regions of the globe. It was introduced into Queensland many years ago as a fodder, but never took on and is now only to be seen as a stray along railway lines, &c.

### Kapoc.

J.C.H. (Port Glasgow, Papua)—

We have little experience with Kapoc here as it is only grown as an ornamental tree or as a specimen tree in public gardens. Some few years ago, in response to several inquiries, we compiled and published some information on it. A copy of the "Journal" containing that matter has been forwarded.

### A Native Fig (*Ficus fasciculata*).

W.H.C. (Malanda, N.Q.)—

The fig is *Ficus fasciculata*, a native fig nowhere abundant, but found here and there on the Atherton Tableland, Eungella Range, and on one or two other places in North Queensland. There is a large number of figs in the scrubs of Queensland—about sixty different sorts—and this seems the best of the lot as an edible fig, in fact, the only really palatable one. We have never heard a common name for it, but if you wanted to give it one you might call it the "Brown Fig," from its character of turning brown when ripe. It should strike quite well from cuttings or could be grown from seeds, but its value would only be, we think, as a "private garden" tree; the fruits bruise very easily and quickly rot.

**"Wild Onion."**

Enquirer (Toowoomba)—

The specimen is *Bulbine bulbosa*, commonly known as Wild Onion. It occurs in all the States except Western Australia, and is generally regarded as poisonous, though no definite feeding tests have been carried out with it. The symptoms of poisoning by it are given as severe scouring, with great pain and a mucous discharge of a green and yellowish colour from the nose.

**Carbide Residue.**

K.G.C. (Westwood)—

Your inquiry regarding the use of carbide from gas plants was referred to the Agricultural Chemist, Mr. J. C. Brünnich, who advises as follows:—"Carbide residue is pure slaked lime, and can be used in place of agricultural lime. It is best to allow the residue to dry and break up to coarse powder before applying to land."

**Plants from the Central District.**

G.W.K. (Sapphire)—

1. *Solanum ellipticum*.—A "Potato Bush."
2. *Pterocaulon cylindrostachyum*.—A common weed: the only local name I have heard is "Rog Weed," a name applied in Queensland to several plants.
3. *Chenopodium carinatum*.—A common plant in Queensland, especially in light soils along watercourses, &c. I have never heard a common name.
4. *Trianthema crystallina*.—A common plant, but I have not heard a common name for it.
5. *Abutilon* sp.—Belongs to a genus that contains several garden shrubs known as "Chinese Lantern" flowers.
6. *Sida subspicata*.—Belongs to the same genus as the common *Sida retusa* or "Paddy's Lucerne."
7. *Epilates australis*.
8. *Rhagodia*.—This and an allied plant are known in Queensland as "Fish Weeds." They are valuable fodders, but are said to give a fishy flavour to the milk of cows feeding on them.
9. *Polanisia viscosa*.—Sometimes called "Wild Mustard." The plant has a wide distribution through Queensland to India.
10. *Amarantus viridis*.—Green Amaranth. The young tops can be used as a substitute for spinach.
11. *Nyssanthus erecta*.—"Needle Bush."
12. *Achyranthes aspera*.—"Needle Burr."
13. *Sida corrugata*.—See note under No. 6.
14. *Abutilon oxycarpum*.—See note under No. 5.
15. *Sida corrugata*, var. *ovata*.—See note under No. 6.
16. Too fragmentary for determination.
17. *Alternanthera nana*.—A weed of the Amaranth family; useful forage.
18. *Justicia procumbens*.—Small herb eaten by stock.
19. *Hibiscus Sturtii*.
20. *Ruellia australis*.—A small herb, eaten by stock.
21. *Euphorbia pululifera*.—Asthma Plant. The dried leaves taken as tea afford some relief in asthma for a time, but the effects are said to wear off after repeatedly taking the infusion.

**Swamp Paspalum.**

W.D.D. (Innisfail, N.Q.)—

The grass is *Paspalum scrobiculatum*, the Ditch Millet or Swamp Paspalum. It is a fairly common grass in Coastal Queensland and grows mostly in wet, swampy places and in such places has some value as growing where other grasses do not do much good. Apart from this, it has no particular value.

**"Giant Couch" or Para Grass.**

M.K. (Dalby)—

The grass commonly known in Queensland as Giant Couch is *Panicum muticum*, a tropical grass known outside of Australia mostly as "Para Grass." It is unquestionably a valuable forage, particularly for places along the coast from Rockhampton northwards, and is one of the principal grasses of the Atherton Tableland. We would say, however, it was quite unsuitable for the Dalby district.

**"Love Grass" (*Eragrostis curvula*).**

L.M. (Ballandean)—

Your specimen has proved to be one of the American species of *Eragrostis* or Love Grasses naturalised in New South Wales. Mr. Whittet informs us it is *Eragrostis curvula*. He says:—"We are growing this grass in our 18-inches rainfall district; it is somewhat harsh but very drought-resistant." E. Breakwell, in his work "The Grasses and Fodder Plants of New South Wales," says:—

"This grass was introduced from America some years ago, and grown at the different experiment farms. It soon asserted itself as a very rapid grower, a free seeder, extremely drought-resistant, but with leaves of a rather harsh character. The leaves are extremely long, tapering very gradually to a fine point. During a dry spell the ends of the leaf wilt and curl up, leaving the rest quite green. The inflorescence is always of a distinct leaden colour, with the spikelets crowded and rather pointed.

"*Eragrostis curvula* does extremely well under cultivation, and has produced yields at Hawkesbury Agricultural College as high as 6 tons of green feed per acre. Owing to its drought resistance it was taken up by different farmers, and although it has been reported on favourably, both for drought resistance and for palatability, it does not seem to have taken on to any extent. Farmers at Taylor's Arm, Nambucca River, have found it an extremely useful grass for spreading over hillsides of poor country, and testify that cattle eat it very rapidly when it is young.

"Although *Eragrostis curvula* is looked on as a permanent grass, it seems to die out after a few years if subjected to hard conditions. New seedlings, however, are constantly appearing, and it could undoubtedly be maintained in a permanent pasture by allowing it to seed. Generally speaking, this grass may be recommended for scattering over burnt ashes in scrub country of poor formation, when it will act as a good stand-by in times of drought."

In general appearance it reminds one of the common Tussock Grass of New Zealand, but the structure of the seed head is quite different.

**"Cherry Penda."**

J.L.T. (Atherton)—

We do not know the species by its common name. It is evidently a species of *Eugenia*, but which one we cannot say from the fruit alone. We have handed the seeds to Mr. Bick, Curator of the Botanic Gardens, for propagation. He is in charge of the Sherwood Arboretum, which is under control of the Brisbane City Council as part of its park system.

**A Northern Species of *Zamia*.**

E.H.H. (Kureen, via Cairns)—

The specimen is *Bowenia spectabilis*, a species of "Zamia" or "Cycad," common in North Queensland. Like the rest of the family, it has been accused of causing "rickets" in stock. No feeding experiments have been carried out with it, but the general symptoms as observed in "Zamia" poisoning are very different from those you describe. The poison is a cumulative one, and the progress of the disease gradual. Attention is first directed to the presence of the disease by a peculiar arching of the back and weakness in the hindquarters. When approached, affected animals become excited and endeavour to get away, but as soon as they get into a fast walk the hindquarters sway from side to side, though in the worst cases an animal cannot go a few yards without falling down and is unable to rise without assistance.

**Needle Burr.**

J.T. (Kaban)—

The specimen is the Needle Burr (*Amarantus spinosus*), a common weed on the Atherton Tableland. It is rather a bad weed pest, but is not poisonous in any way. Apart from its spines it is quite edible, and the young shoots of it and allied species are used in India and other Eastern countries as greens.

**A Poisonous Lily (*Dianella laevis*).**

F.W.N. (Birkdale)—

The specimen is *Dianella laevis*, a plant of the Lily family, fairly common in Queensland, but for which I have not heard a local name. It has been recorded as poisonous both here and in New South Wales. No definite feeding experiments have been carried out with it, but as other members of the genus abroad are recorded as poisonous, the plant should be cut out from paddocks to which stock have access.

**A Poisonous Plant (*Datura stramonium*).**

"QUERIST" (Townsville)—

The cases of stock poisoning by *Datura stramonium* that have come under our notice have been confined to cases where the plant has been found as an impurity in chaff. It is fairly common in cultivations, and disastrous losses have occurred through stock eating chaff containing *Datura*. All parts of the plant are poisonous, but the growing plant is rarely touched by stock as it has a nauseous taste and odour. One case is, however, recorded by Bailey and Gordon ("Plants Poisonous and Injurious to Stock," page 55). The commonest *Datura* on the Central-West and Northern Downs is *D. Leichhardtii*, a native species which is very abundant on the black soil plains. This has been suspected of poisoning stock at times, though it must be only very rarely eaten. No work has been done on it, but as all the genus are poisonous, it is not likely to prove an exception. An article on the genus was published in this "Journal" for July, 1917.

**"Tick Trefoil"—Carpet Couch.**

W.E.P. (Maroochydore)—

The "clover" or "trefoil" is *Desmodium triflorum*, a species of "Tick Trefoil." The local name is given to it on account of the pods breaking up into small one-seeded pieces which stick to clothing, and around the feet of horses and cattle. It is quite a useful fodder. The grass is *Paspalum platycaule*—Carpet Grass or Carpet Couch. A useful grass for growing where the better-known grasses, such as ordinary *Paspalum dilatatum* and Rhodes, do not succeed.

It is very hard to get grass established in Wallum and Honeysuckle country. You might try transplanting roots of the species—small rooting pieces like that you sent put in and lightly buried in showery weather or when the soil is damp should thrive readily enough. A mixture of ordinary Couch and *Paspalum compressum* (or *Axonopus compressus*) might be tried. Rhodes might do in the better patches.

Some annual trefoils, such as the Medick Burr (*Medicago denticulata*), might do, but seed is unfortunately not generally stocked by seedsmen.

**Castor Oil Plant.**

G.C.B. (Wallumbilla)—

The specimen is a variety of the common Castor Oil (*Ricinus communis*). It was very mouldy when it reached us, but seems the form with large red seed pods that is naturalised in some parts of Queensland. The seeds are poisonous, due to the presence of "ricin," a very poisonous toxin. It is to this and not to the oil, which is a safe purgative, that the poisonous properties of the beans are due. In the extraction of the oil the poisonous principle is left in the residue, which makes it unsafe for the manufacture of cattle-cakes. The symptoms of poisoning are vomiting, gastric pain, diarrhoea, and dullness of vision.

**Shade Trees Suitable for the Helidon Area.****"Inquirer" (Helidon)—**

Following is a selection of shade trees suitable for Helidon. The list could, no doubt, be extended, but we have confined it to species more or less readily obtainable:—

- Magnolia grandiflora*.  
*Flacourtia cataphracta*. Cataphracta Plum—edible fruit.  
*Pittosporum undulatum*.  
*Lagunaria Patersoni*. Pyramid Tree.  
*Sterculia trichosiphon*. Broad-leaved Bottle Tree.  
*Calodendron capense*. Cape Chesnut.  
*Plindersia australis*. Crow's Ash. One of the best shade trees, we should say, for your locality.  
*Nephelium tomentosum*.  
*Harpullia pendula*. Tulip Tree.  
*Schinus teretinthifolius*. Broad-leaved Pepper Tree.  
*Harpephyllum caffrum*. Kaffir Plum.  
*Ceratonia siliqua*. Carob Bean.  
*Gleditschia triacanthus*. Honey Locust.  
*Ligustrum lucidum*. Privet.  
*Jacaranda mimosæfolia*.  
*Grevillea robusta*. Silky Oak.  
*Stenocarpus salignus*. Wheel of Fire.  
*Celtis australis*.  
*Celtis sincensis*.

(Both species of *Celtis* are deciduous and called Portuguese Elm. They would do well with you, and the foliage has some value as a stock food.)

- Ficus platypoda*. Small-leaved Moreton Bay Fig.  
*Ficus macrophylla*. Common Moreton Bay Fig.  
*Platanus occidentalis*. Plane Tree.  
*Pinus longifolia*. Chir Pine.  
*Araucaria Cunninghamii*. Hoop Pine.  
*Araucaria Bidwilli*. Bunya Pine.  
*Washingtonia filifera*. Cotton Plant.

**Saltbush.****F.L.P. (Brixton, Central Queensland)—**

Reference your two specimens of saltbush—The one with smaller fruits ("seeds") is *Atriplex Muelleri*—perhaps the commonest saltbush in Western Queensland. The one with larger, spongy fruits is not a freak but a distinct species—*Atriplex halimoides*. It is fairly common in some places, particularly in the south-western parts of the State. It is very common about Quilpie and westward to Windorah. We have also received specimens from the neighbourhood of Longreach, but we do not know if it is common there.

**Plants Identified.****"INQUIRER" (Townsville)—**

1. *Corchorus hygrophilus*. A fairly common plant in the Gilliatt country, but for which I have not heard a common name. It is not poisonous or harmful in any way.
2. *Euphorbia eremophila*. Caustic Plant. This occurs in all the mainland States, both on the coast and inland. It is generally regarded as very poisonous, and as it belongs to a dangerous group the suspicion attaching to it is probably based on fact. No feeding experiments, so far as I know, have been carried out with it.

The smaller plants contained in the same bundle belong to *Andrachne Decaisnei*—a very common plant over the Central and Northern downs. It is not known to be poisonous in any way.

**The Peanut.**

S.F.R. (Kawl Kawl)—

In reply to your queries regarding the Peanut:—

*Botanical Name.*—*Arachis hypogaea*. Family, Leguminosæ.*Country of Origin.*—South America (Brazil and Peru).

*When Introduced into Civilisation.*—A great deal has been written about this, but De Candolle, in his "Origin of Cultivated Plants," says he is inclined to the belief that the first slave ship carried it from Brazil to Guinea, and the Portuguese from Brazil into the Islands to the south of Asia in the end of the fifteenth century. It has been variously stated to have originally been a native of Tropical Africa, China, &c., but the foregoing are the now generally accepted facts.

*Principal Kinds.*—Six other species of *Arachis* are known from Brazil, but only *Arachis hypogaea* is the one in cultivation. The United States is one of the biggest growers of peanuts, and about ten varieties are generally recognised:—Virginia Runner, Virginia Bunch, Spanish, Small Spanish, Improved Spanish, North Carolina, African, Valencia, Tennessee Red, Georgia Red.

In addition to the above one often sees a particularly large one, two or three times the size of the ordinary peanut, and known as "Chinese Giant." It was imported by and grown at the State Nursery, Kamerunga, but for some reason or other it never took on.

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**PIG RAISING.**

*Selected from the outward mail of the Instructor in Pig Raising, Mr. E. J. Shelton, H.D.A.*

**Impaction in Pigs.**

T.G. (Laidley)—

In our opinion the pig referred to died of constipation. This trouble affects pigs of all ages, and is especially severe on breeding sows approaching the farrowing stage. In fact, many sows die each year as a result of bowel troubles, others have trouble in farrowing, while others develop milk fever and similar ailments, which usually terminate in the loss of milk and the death of the young pigs. We recently investigated a case at Kingaroy, in which a farmer there lost several good quality pigs approaching bacon age. He was of opinion that the pigs had swine fever or some such disease, but was quite convinced it was constipation when a search of the yards in which the pigs were kept resulted in but a few small pebbles of hard, dry dung being found, with no indication at all that the pigs had any motion of the bowels for several days and were evidently in great pain, straining and endeavouring to rid themselves of dry, fibrous dung, the accumulation of many days.

Most pigs are subject to intestinal parasites at one or other stage of their existence, and the fact that you found one large, round white worm in the pig that died would not indicate any serious trouble. If you had collected fifty such worms, then you would have been justified in blaming these parasites for the mortality.

In cases of severe constipation, the most effective remedy is the enema. Enemas of warm, soapy water to which has been added one tablespoonful of olive oil or glycerine, are helpful in relieving the bowels. Follow this up with a dose of two packets of Epsom salts dissolved in half a pint of warm water and given as a drench, compelling the animal to take liberal exercise about three hours after dosing. Complete change of food is then advised. For the pigs not yet suffering, reduce the amount of corn and sweet potato vines and feed on skim milk, pumpkins, and green lucerne, compelling them also to take regular exercise in a good roomy pig run. There should be no need for medicine if pigs are kept in good sized runs and are given liberal supplies of green lucerne, &c. Sweet potato vines are not poisonous, but pigs consuming too many vines are liable to suffer from serious digestive disorders.

**Preparing Pigs for Show.**

W.V. (Boonah).—

The preparation of pigs for exhibition is largely a matter of care and attention in feeding and handling, having due regard to the classes in which the animals are to be exhibited. Size and condition count for much in classes in which age is a condition of entry. That is to say, a pig entered in a class for boar or sow twelve months and under needs to be as near to twelve months old as is possible. A pig three months old or thereabouts in a twelve months old class stands a very poor chance. Colour markings and breed characteristics vary with the different breeds. Keeping the skin and hair in good condition by frequent oiling either with petroleum jelly, cocoanut oil, or some other preparation, also counts for a great deal, while having the animals accustomed to handling and moving about at will is a very great help when it comes to their exhibition. It really pays to exhibit and sell the best of the pigs only. All others should be promptly prepared either as porkers or baconers and be disposed of. To those who hope to make a success of the stud pig business, the exhibition of stock at shows, advertising the stock for sale in suitable journals and papers, and prompt attention to correspondence and the supply of pedigree, &c., are features well worth note. There is no royal road to success, but there is no reason why with careful attention to the business aspect and regular and judicious handling of the stock, plus having good stock, you should not succeed.



*Photop. Miss J. Easton.]*

**PLATE 11.**—"WHERE THE HORSES COME TO WATER AT THE RISING OF THE MOON."  
THE WILLOW-SHADED POND ON COOCHIN COOCHIN STATION, NEAR BOONAH.

## General Notes.

### Broom Millet Board Election.

The recent election for the appointment of two members to the Broom Millet Board resulted as follows:—

Hans Niemeyer, Hatton Vale, Laidley .. ..	78 votes
Erich Max Schneider, Binjour Plateau .. ..	76 votes
George William Harberger, Coalstoun Lakes .. ..	30 votes
Informal .. .. .	2 votes

Messrs. Niemeyer and Schneider, together with the Director of Marketing, will therefore be appointed to the Board and will hold office for a term of one year as from the 18th May last.

### Regulation Announcements.

Proclamation No. 5 under the Diseases in Plants Acts, dealing with the introduction of grapes from New South Wales and Victoria, has been rescinded, and a new Proclamation has been issued in lieu thereof.

This is practically identical with the old one, with the additional condition that grapes (fruit) from the Murrumbidgee Irrigation Area of New South Wales entering Queensland *via* Wallangarra must be branded with the word "Grapes" on one end of each case in letters of not less than 2 inches in height.

A regulation has been issued under the Diseases in Plants Acts, which provides that all tomato and potato plants must be sprayed or dusted with Bordeaux or Burgundy Mixture as follows:—

In the case of tomato plants—Firstly, in the seed bed; secondly, on being planted out; thirdly, thirteen days after being planted out; and fourthly, when the fruit is setting; and at any other such time as an inspector may direct.

In the case of potato plants—When the plants are 6 to 8 inches in height, and subsequently every seven to fourteen days, as weather conditions may warrant; and at any other such time as an inspector may direct.

Any person who does not comply with this regulation is liable to a penalty of £5 for a first offence, and not exceeding £20 nor less than £5 for a subsequent offence.

### Wheat Pool.

A Proclamation has been issued to extend the Wheat Pool for a further period of five years after the 1927-28 season.

Provision is made for the taking of a poll upon the question of the extension of the pool. Any petition for a poll must be signed by at least five hundred growers who delivered wheat to the State Wheat Board during the seasons 1926-27 and 1927-28, and must reach the Minister not later than the 1st June, 1928.

### Sugar Assessment.

The assessment for the 1928-1929 season under the Regulation of Sugar Cane Prices Acts and the Sugar Experiment Stations Acts has been fixed at the rate of 1½d. and ¾d. respectively on every ton of sugar-cane delivered at sugar works during the season. Such assessment is payable by the owner of sugar works in the first instance.

The assessment for last season was ¾d. per ton under both Acts.

Assessments have also been levied under the Sugar Experiment Stations Acts for the purpose of financing Cane Pest Boards. The assessment for the Tully and South Johnstone Boards has been fixed at 1½d. per ton, and for the Lower Burdekin and Plane Creek Boards ¾d. per ton.

### Wire and Wireless.

The Queensland Pastoral Supplies, Limited, announce important reductions in the price of fencing wire and netting. They have also perfected an excellent three-valve wireless set, which they are selling complete with all accessories and loud speaker. This set will bring in all main Australian Stations at reasonable loud speaker strength.

### **Cotton Board.**

The Cotton Board has issued a notice requiring all growers of seed cotton to furnish a return showing the area under crop at the time of flood damage, the estimated quantity of cotton on bushes ready for harvesting destroyed by flood waters, and the estimated quantity of cotton harvested awaiting transport which has been destroyed by flood.

### **A Distinguished Visitor from South Africa.**

Sir Arnold Theiler, K.C.M.G., of South Africa, in the course of a recent preliminary visit to Brisbane, prior to a tour of investigation in other States of the Commonwealth, met the members of the Commonwealth Tick Dip Committee at the office of the Department of Agriculture and Stock. Those present were Dr. W. A. N. Robertson (representing the Commonwealth Government), Messrs. J. C. Brunnich, A. H. Cory, and C. J. Pound (representing the Queensland Government), Messrs. M. Henry and C. J. Sanderson (representing the New South Wales Government), and Mr. R. P. M. Short, Secretary.

The investigations of the Committee were explained to the distinguished visitor, and advice given by him, as a result of his South African experiences, on the cattle tick will be of distinct benefit to the Committee in their operations. A visit was paid to the Samford Experimental Farm on the following morning.

It is the intention of Sir Arnold Theiler to visit this State for an extended period this month.

### **Wheat Board.**

Regulation 3 under the Wheat Pool Acts has been reseeded, and a further Regulation approved, providing that representatives on the Board shall be elected by growers of wheat who delivered to the Board wheat harvested during either of the two previous seasons, by growers of wheat to whom seed wheat has been supplied by the Board for the year in which the election is held, and by other bona fide growers of wheat who may make application for and obtain a voting-paper.

### **Points in Citrus Marketing.**

Production is only one-half of the business of profitable orcharding—the preparation of the crop for disposal is a matter of no less importance. The following points should be observed by the citrus grower in the marketing of his fruit:—

1. Exercise extreme care in handling.
2. Place fruit carefully in picking bags.
3. Carefully transfer fruit from picking bag to box.
4. See that the box has no protruding nails or splinters.
5. Do not jolt the fruit over rough roads.
6. Grade carefully for size and quality.
7. See that the sizing machine is functioning properly.
8. Use a clean case.
9. Pack neatly and tightly, but do not squeeze or jamb fruit into boxes.
10. Stack cases on sides.

### **The Orchard Ladder.**

In many orchards one sees a huge, heavy ladder which one man shifts from tree to tree with difficulty, and it is so constructed that it cannot be conveniently placed to enable the operator to carry out his work expeditiously. Such a type of ladder often damages fruit spurs and fruit when being placed in position. Some ladders are in the last stages of decrepitude, some have lost steps, others are so rickety that if the ground is a little uneven they require to be supported while the operator is picking or pruning. Orchardists should take stock of their ladders, and, if they have not done so already, they should secure a strong, light, serviceable ladder, the use of which will economise time and labour.

It is not necessary to use sawn timber in making an orchard ladder. Anyone who is handy with tools can make a good ladder from the round bush timber which is very often easily obtainable.

### Staff Changes and Appointments.

Messrs. A. L. M. Wilson, W. A. Douglas, B. Hart, A. C. Wishart, and Dr. G. Croll (of the Royal Queensland Yacht Club), and Mr. W. A. Winchester (Manager of Queen's Theatre, Bundaberg), have been appointed Officers under the Animals and Birds Acts. Constable W. H. Ewin, of Tallebudgera, has been appointed an Inspector of Slaughter-houses.

The resignation of Mr. J. Smith as Millowners' Representative on the Central Sugar Cane Prices Board has been accepted.

Messrs. F. M. B. Little, A. H. Biggs, H. Goodson, and R. Johnston, of the Southport District, and Mr. R. McCowan, of Brisbane, have been appointed officers under and for the purposes of the Animals and Birds Acts.

It has been approved that Mr. L. P. Doyle, Inspector of Stock, be attached to Cloncurry, and that Mr. J. Bishop, Inspector of Stock, be transferred from the Helidon to the Kingaroy District.

Mr. W. B. Christie, of Cooran, has been appointed Honorary Inspector under the Diseases in Plants Acts.

Mr. E. B. L. Filer, Assistant, Fruit Branch, has been appointed Temporary Inspector under the Diseases in Plants Acts as from 1st June, 1928.

The appointments of Miss N. Walsh and G. Becker as Assistant Cane Testers at Millaquin and Pleystowe Mills, respectively, have been rescinded, and Miss Walsh has been appointed Assistant Cane Tester at the Pleystowe Mill.

The following appointments of Cane Testers and Assistant Cane Testers for the 1928 crushing season have been made:—

Cane Testers—T. D. Cullen, Bingera; Miss I. McGill, Fairymead; C. H. Jorgensen, Gin Gin; Miss I. Palmer, Isis; Mrs. Kate Dunton, Maryborough; C. J. Boast, Millaquin; Miss A. L. Levy, Moreton; Mr. T. V. Breen, Mossman; L. G. H. Helbach, Pleystowe; Miss M. T. Smith, Plane Creek; Miss D. Marles, Qunaba; V. F. Worthington, Racecourse; J. Howard, Rocky Point; W. Ahern, Cattle Creek; L. McCready, Farleigh; T. P. Brown, Marian.

Assistant Cane Testers—Miss M. Orr, Bingera; Miss O. Knight, Farleigh; Miss M. A. Lyle, Marian; Mr. H. T. Witcher, Maryborough; Miss N. Walsh, Millaquin; Mr. G. Becker, Pleystowe; Miss E. Rowe, Pleystowe; Miss M. Morris, Plane Creek.

Mr. J. Carew, Assistant Instructor in Sheep and Wool, has been appointed Acting Instructor in Sheep and Wool, Department of Agriculture and Stock, as from 24th May, 1928, and until 31st December, 1928.

The following transfers have been approved, of Inspectors under the Diseases in Plants Acts:—

Mr. T. Lowry, at present attached to Stanthorpe, to be attached to Brisbane;

Mr. F. A. L. Jardine, at present attached to Nambour, to be attached to Stanthorpe;

Mr. E. J. Lorraine, at present engaged on wharf and market inspections, to be transferred to outside field inspections.

It has also been approved that Mr. H. St. J. Pratt, Assistant Instructor in Fruit Culture, undertake the supervision of the inspectors in the Stanthorpe District.

Mr. L. A. Downey, of Hawkesbury Agricultural College, Richmond, New South Wales, has been appointed Assistant Instructor in Pig Raising.

Mr. W. H. Bechtel, Manager of Warren State Farm, has been appointed Acting Assistant Instructor in Agriculture at Rockhampton.

The resignation has been accepted of Mr. H. J. Campbell, Inspector of Slaughter-houses.

Mr. H. Jensen, Miss E. Christsen, and Messrs. P. H. Compton and T. Herbert have been appointed Cane Testers at the Babinda, Pioneer, South Johnstone, and Tully Mills, respectively, and Miss M. Bennett has been appointed Assistant to Cane Tester at the Tully Mill.

Constable R. G. Kinnane, of Dalby, has been appointed Inspector of Slaughter-houses.

Constable J. S. Harper, of South Kolan, has been appointed Inspector of Slaughter-houses.

Mr. J. C. Pryde, of Spring Bluff, has been appointed Temporary Inspector of Stock at Rockhampton until the 4th July, 1928.

Messrs. M. Wilshire, S. R. Scott, F. B. Loel, E. L. Carpenter, J. Wilson, H. Middleton, V. I. Spalding, S. O. D. Arthur, John Newlands, W. J. Newlands, and C. D. Thompson (Inspectors under the New South Wales Diseases in Stock Act) have been appointed Inspectors of Stock, to operate in the Stock District of Warwick.

The appointment of Mr. H. H. Jennings, of Texas, as Acting Inspector of Stock has been cancelled.

The Officer in Charge of Police, Jondaryan, has been appointed Acting Inspector of Stock as from 26th May, 1928, and Mr. P. J. Short, Temporary Inspector of Stock at Goondiwindi, until the 31st July, 1928, during the absence on leave of Mr. Singh.

Mr. J. Macfie has been appointed Inspector of Cane Testers, with headquarters at Bundaberg.

Constable B. M. Howard, Stewart's Creek, has been appointed Inspector of Stock and Brands, and Constable E. Brown, Ewan, Inspector of Brands.

Mr. J. D. W. Ogilvie, Dairy Instructor, Ipswich, has been appointed Grading Inspector, Dairy Branch, Department of Agriculture and Stock.

Mr. E. S. Smith has been appointed Millowners' Representative on the Central Sugar Cane Prices Board, vice Mr. J. Smith, resigned.

Constable W. Lafferty, of Jericho, has been appointed Inspector of Slaughter-houses.

Dr. N. M. Gutteridge, of Toowoomba, has been appointed an Officer under the Animals and Birds Acts.

The appointments of Messrs. N. James and W. Broome as Honorary Inspectors under the Diseases in Plants Acts have been cancelled.

Mr. F. R. Pearce, of Koliyo, N.C.L., has been appointed Canegrowers' Representative on the Farleigh Local Sugar Cane Prices Board, vice Mr. J. McIntyre, resigned.

### The Royal Society of Queensland.

The ordinary monthly meeting was held in the Geology Lecture Theatre of the University on Monday, 28th May, 1928.

The President, Professor T. Parnell, was in the chair, and fourteen members were present.

Messrs. W. J. Chamberlain, M.Sc., Inigo Jones, and T. Rimmer, M.Sc., were elected ordinary members of the Society.

Mr. F. W. Moorhouse, B.Sc., was nominated for ordinary membership by Mr. D. A. Herbert, and Mr. R. C. Cowley by Dr. J. V. Duhig.

Mr. A. P. Dodd, in a few introductory remarks, tabled a paper on the "Revision of Four Genera of Scelionidae."

Mr. A. P. Dodd also delivered a very interesting lecture on "Prickly-pear Insects." In outlining the subject he pointed out that the prickly-pears (*Opuntia* spp.) had been introduced into Australia without their natural enemies. Owing to this, and to favourable climatic conditions, they had spread rapidly and become a pest. In their native habitats, Southern North America and South America, the various forms of prickly-pear were kept in check by natural enemies in the shape of insect pests.

The Prickly-pear Board has concentrated its activities on investigating insects adversely affecting the pear and on introducing those found the most effective. On arrival they are carefully tested by laboratory and field experiments, to ascertain whether they will attack economic or other plants as well as members of the *Opuntia* family.

Mr. Dodd gave an interesting review of the introduction, breeding, testing, and liberation of insects, and he stated that so far the Indian cochineal and *cactoblastus* had proved the most effective, and with the aid of these insects the prickly-pear was now held in check from spreading, and there is every probability of its gradual extermination.

Mr. C. T. White, in proposing a vote of thanks to the lecturer, paid a tribute to the good work being carried on by Mr. Dodd and his staff. Mr. J. B. Henderson, in seconding the motion, outlined the events leading to the formation of the Prickly-pear Board, and gave instances of the very effective work of pear destruction.

### Clean up the Packing Shed.

A thorough clean-up of the packing shed should be made before closing it down at the end of the packing season.

All cases or other receptacles that have held fruit should be dipped under boiling water for not less than three minutes, and any sacking used on packing benches should be similarly dipped, or if valueless, burned. All cracks and holes in benches or other packing-house appointments should be probed, and any lurking codling or other injurious insect larvae killed. At all times the sweepings from a packing shed should be thrown on to a fierce fire. Codling moth bandages are best left on the trees till well into the winter.

Pruning operations offer the best opportunity for a close tree-to-tree scrutiny for pests such as San Jose scale. Affected trees should be marked for future treatment.

### Scab in Potatoes.

There are three common causes of scab in potatoes; two distinct types result from the action of fungous parasites and the third is caused by eelworms.

Rhizoctonia scab (the form perhaps most frequently found) receives its name from the fungus (*Rhizoctonia solani*) which is the cause of the disease. This fungus is readily recognised on affected tubers in the form of small black masses or lumps, which vary greatly in size and shape. On account of this feature the disease is sometimes called "black speck scab" or "black scurf." The fungus structures at first sight appear like lumps of soil, but they show up distinctly black when wetted and they do not wash off. The superficial position of the fungus sometimes leads growers to think that the disease is of little importance. The black bodies, however, represent the resting stage of the fungus, which is able to develop rapidly under favourable conditions.

Generally speaking the disease results in most damage under cool moist conditions. It may attack any of the underground portions of the plant. The young growing shoots may be entirely destroyed. In other cases the disease may develop on the underground stem, stolons, or roots, where it is readily recognised in the form of brown discoloured areas. When the stem is severely attacked, or when the stolons are girdled, a number of small tubers may be produced on the stem and in axils of the leaves. Frequently also the leaves become bunched in the form of a rosette.

Unfortunately the fungus is able to live in the soil in the absence of the potato plant and it may grow on a number of other root crops and grasses. Once a soil becomes heavily infested little can be done to exterminate the disease. In most instances, however, the disease arises from the use of untreated, diseased tubers.

Every care should be taken that the disease is not introduced at the time of planting. Clean selected seed should be used whenever possible. This, however, is not always practicable, but effective control may still be obtained by seed treatment in a fungicidal solution of either corrosive sublimate (mercuric chloride) or formaldehyde. Dipping the seed before sowing should be adopted as a general practice and, generally speaking, corrosive sublimate is more effective than formaldehyde for this purpose.

A caution is necessary. Corrosive sublimate is a deadly poison if taken internally by stock or by human beings. The solution, however, is quite harmless on the hands. Treated potatoes are unfit for domestic use or for feeding to stock.

The solution is made up of corrosive sublimate (mercuric chloride) 1 oz. and water 6½ gallons. The corrosive sublimate should be dissolved in about a quart of warm water and then diluted to the required amount. A wooden vessel should be used since the chemical will attack metal and thus lose its strength.

The seed potatoes should be immersed for from 1½ to 2 hours. It is inadvisable to dip the potatoes in bags, since this weakens the solution. It is far better to place the tubers directly in the solution or else to use a small wooden crate. The solution should not be used for more than three batches at a time. This is particularly necessary if there is much dirt adhering to the tubers, as there is then a tendency for the solution to weaken very rapidly. The tubers should not be cut and preferably should not be sprouted. If they have sprouted slightly every care should be taken not to injure the sprouts and the time of dipping should be shortened.

It is a good plan to keep the tubers moist for twenty-four hours before treatment to loosen the dirt and soften the fungous material, which is then more readily killed by the fungicidal treatment.

### Objectionable Flavours in Cream.

Although it is most desirable from many points of view that cows should have a plentiful supply of good, clean drinking water, sometimes the water is blamed for second-quality cream, when in reality it has nothing whatever to do with it. Although tainted drinking water can, and does, impart certain flavours to cream, it rarely happens that such flavours cause the cream to be graded second quality. Whatever flavour the water may impart is absorbed from the body of the cow before and during the secretion of the milk, and it does not become worse as the cream is kept, but sometimes gradually disappears. In any case, it can usually be partially or wholly removed by the ordinary treatment at the factory. This class of flavour is not so important for that reason.

Bacterial flavours, for instance, gradually become worse and worse as the cream is kept, but absorbed flavours imparted by water do not. Where cows wade in muddy pools or waterholes, it is the contamination they carry out on their legs, flanks, tails, and udders which causes trouble later on. This is one of the commonest causes of ropy milk or cream. The bacteria responsible find their way into the bucket during milking, and from there into other utensils or separator parts, where they may exist for some considerable time, unless proper precautions are taken. The boiling water treatment will kill the bacteria responsible for ropy cream.

### A Bad Practice.

The mixing of warm, freshly separated cream with a cold, ripe cream from a previous separation is very often accompanied with disastrous results as regards quality. It is bad practice for several reasons, one being that the temperature of the bulk of the cream is thereby increased, resulting in increased bacterial activity. Again, if the older cream is very acid and thinly separated, the casein will most likely be precipitated in the form of white specks, which everyone is acquainted with as ordinary curdled cream, or again a "junkety" condition may be brought about. All these defects may result in the cream being graded second quality.

Fortunately, this practice is fast disappearing, but it sometimes occurs where cream is forwarded daily to the factory. The cream lorry comes soon after the morning separation, and in order to get both separations away the creams are mixed while the morning separation is still warm. "Junkety" cream often occurs where this is done, and to obviate it the morning cream should be cooled before mixing. If a cooler is not available for this purpose, by standing the tub in a can of water and stirring the cream briskly for ten minutes the temperature can be reduced slightly.

### Five Functions of Food for Milch Cows.

Improper feeding of dairy cows is one of the chief causes of unprofitable dairying. This is evidenced if the butter production in a good year be compared with that in a bad year. Proper feeding alone does not suffice to secure the greatest productivity, points out a departmental pamphlet, but must be accompanied by good care and management. It has been demonstrated that the production of some poorly-kept cows can be increased as much as 50 per cent. by improved methods of feeding and care.

It must not be forgotten that a cow may use a feed for five different purposes:—

1. Growth.—Since cows do not mature until they are four or five years old allowance must be made for growth requirements.

2. Maintenance.—A certain amount of the feed is used simply to maintain the body without gain or loss in weight.

3. Production of Milk.—Necessitating feed in addition to that used for maintenance.

4. Increase in Weight.—Cows normally increase in weight during the latter part of their lactation period and during the rest period. This increase requires feed.

5. Production of Offspring.—The fifth purpose for which a cow requires feed; the amount, however, is relatively small.

It is evident that in feeding for milk production, the various functions which feed fulfils must be considered with regard to the future development of the cow as well as to her immediate needs. Liberal feeding usually proves much more profitable in the long run than scanty feeding.

### Points in Maize Seed Selection.

1. Select seed in the field only from those plants which produce good ears under normal or adverse conditions of space, &c.
2. Do not select for two or more ears on the stalk unless the first is up to standard size and quality.
3. Select ears which are at a medium height on the stalk, neither too high nor too low.
4. Select only those ears which are well covered and protected by the husk. Only such ears remain free from weevil infestation in susceptible districts.
5. Select ears which droop when approaching maturity for increased resistance of the variety to weather damage. Erect ears are usually found on short, thick shanks.
6. Select ears from those plants which produce a large ear for a limited growth of stalk for economy in grain production.
7. Avoid the selection of those ears from plants which are blown down or broken down, no matter how good the ears may appear. Root and stalk rot diseases are transmitted readily through the seed. With regard to the diseases just referred to take care also (a) to avoid ears from prematurely ripened stalks, (b) to regard brace-rooted stalks with suspicion, (c) to select seed early to more largely prevent mycelium of the fungus penetrating the seed by systematic infection, (d) to dry seed ears quickly by storing in a dry, warm, well-ventilated place in an endeavour to prevent the fungus (if any) making further growth from the core into the seed.
8. Maintain a special seed plot of field-selected seed.

### Milking Machines and Cleanliness.

The secret of getting good milk and cream where milking machines are used is absolute cleanliness from the start. Once the rubber parts get contaminated they cannot be cleaned—to throw them away and get new ones is the only course.

A thorough cleaning once a week is not going to result in choicest grade at the factory. All parts of the machine must be cleaned carefully every day, and between milkings the inflations and tubes should be soaked in lime water, renewing the lime water often, as it soon becomes stale and smelly.

When removing cups from one cow to another care should be taken to see that they are held so as to fall over and break the suction. If they are carried face towards the ground all the dust and manure on the floor is sucked into the tube and thence into the buckets and vat.

Milking machines require a good deal of attention and punctilious care in cleaning if they are to prove satisfactory.

### Roughage for Dairy Cows.

Roughage is often the cheapest form of digestible nutrients, and cows should be allowed all the roughage they can consume. Maize silage and lucerne hay are probably the ideal roughage for a dairy cow. They should be fed at the rate of 3 lb. of silage and 1 lb. of hay for each 100 lb. of live weight. Lucerne hay being a legume is much superior to non-leguminous hay for cows in milk. The non-leguminous hays are low in digestibility, tend to be constipating, and are low in protein and mineral matter. They are often useful in limited amounts when fed with some high quality lucerne hay.

The remarkable qualities of maize silage and lucerne hay as a ration for milk production have been demonstrated in the Jersey herd at Hawkesbury Agricultural College, New South Wales. Recent figures show that the average amount of feed consumed per head daily by cows under test was 30 lb. of silage and 10 lb. of lucerne hay, while the average production of milk during the same period was 26.24 lb. per head daily. For the above reason alone, lucerne can be described as the best fodder crop grown for the purpose of feeding cows. It is particularly useful in balancing all rations, especially where green maize is grown. Lucerne should be grown on all dairy farms where the object is to feed for milk production.

For providing fodder in the winter, farmers cannot be too strongly advised to grow a green cereal crop, such as green oats or green barley. These can be mixed with either vetches or field peas. They should be chaffed for preference with the ration, but good results are also obtained by grazing.

# The Home and the Garden.

## LANDSCAPE GARDENING.

The landscape gardener must possess a good deal of artistic taste, as he deals with the landscape and its improvement. Should alterations be necessary, they must be carried out in as natural a manner as possible, and they must be in unison with the surrounding country. Any existing natural features may be made the most of.

If trees shut out a desirable view, they may with care be removed. Tree thinning also becomes necessary when some are spoiling others. It is better to have one good specimen than several poor ones. When tree planting, the gardener must look forward, and consider their size, when maturity is reached.

Broad stretches of lawn may be broken up with shrubs or specimen trees, or beds of flowers. The character of the soil, and the situation must be taken into consideration when planting. It is of no use to plant trees or shrubs that are not likely to succeed, and if doubtful ones are included they must be in positions where they can be easily replaced should they fail. The character of the dwelling must also be taken into consideration.

Vista making is an important part of landscape gardening, and to carry it out the various points of vantage have to be ascertained and their values determined. The outline of the landscape from the various vantage points must be undulating, not straight or unbroken, and though special hues in greenery may be made the most of, they must not be repeated until the eye wearies of them.

Paths should be as few as possible, and each should be made for some definite purpose. They should run in bold but graceful curves, especially when made of gravel.

If summer houses are included they should not stand out aggressively, and they should be covered with creepers as quickly as possible.

## ANIMAL MANURES.

Farmyard manures are solid and liquid excreta from animals, and form one of the universal manures used by most gardeners—complete for all purposes in horticulture. It must, however, be used with care and intelligence. In some places where large and cheap supplies are available, the soil is saturated with manure.

The greater the quantity of manure incorporated with the soil, the greater the necessity for plenty of fresh air to bring about decomposition and ultimately humus. Now, if a soil has not been deeply dug or trenched, and it happens to be of a heavy nature, it is possible that the rains will not pass away readily; then the manure begins to get sour, fresh air, with its oxygen is driven out, carbonic acid gas develops too freely, and the beneficial bacteria are suffocated or annihilated by their enemies, which come into being owing to the lack of fresh air.

To avoid these troubles the soil should be well and deeply dug, and whenever extra large quantities of manure are used, the soil should be afterwards dressed with lime to keep it in a sweet condition.

## FLOWERING SHRUBS.

*Lagerstræmia indica* varieties.—There are many beautiful forms of this shrub on the market, and the finest varieties have been raised in Queensland—*L. Matthewsii* and *L. Earesiana*, the colours of both are lilac, but *Matthewsii* is the darker shade. The heads of bloom of both varieties attained a length of about 24 in., and the individual flowers are a couple of inches across. The plant may be grown in any small garden, and the size may be kept at the will of the gardener. Specimens growing in Brisbane range from a few feet high to 20ft.

The plant stands severe trimming, in fact, it stands the knife so well that it can be grown almost any height by being cut back in July every year, like a grape vine. One of the finest specimens of *L. Matthewsii* can be seen growing on the river side of the Customs House garden. Plants are easily raised from cuttings taken

from the previous year's wood and planted during July and August. Also plants well established may be purchased at any of the nurserymen's stores.

**Gardenias.**—In the earlier days of Brisbane there were few gardens without a gardenia, now they are rarely seen. *G. Thunbergii* is one of the varieties that should be grown. The flowers are pure white, exquisitely scented, and the foliage of all the varieties are a glossy green. These plants are not too fond of pruning, and should be allowed to grow in their own way. *Gardenia florida* is mostly grown for florists' use, the flowers being perfect in form and have not the heavy perfume of the other varieties. All the gardenia family are subject to scale diseases, but are easily kept clean by occasional sprayings with boiler water that has plenty of soap in solution. The plants never attain any size, so are very useful in small gardens.

**Oleander.**—In the northern part of the State these plants flourish, and are much admired by visitors from the Southern States and overseas.

The plants attain a fair size if not kept within bounds. In some of our northern towns it is quite common to see plants 20 to 30 ft. high, and of many colours. The plants are grown in Brisbane, but by a few only, yet they grow just as well here as in the north. The smaller growing varieties should be more extensively grown, and the pink "Carmica," white "Madona," Carmine "Delphine" are all good old varieties.

When growing the plants in small gardens it is necessary from their earliest stages of growth to keep them well headed back, the young wood of the previous year being the flowering wood.

**Lantana.**—The small varieties of lantana are not in common with the pest scattered all over Queensland, and are very beautiful when trained as hedges or shrubs. The tangerine coloured variety and the canary yellow variety are the two usually grown in Southern Queensland. Splendid specimens of these are growing in the Botanic and Museum gardens. The plants flower for nine months of the year, and will grow in almost any soil and will stand fairly hard conditions.

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## KITCHEN GARDEN.

Nearly all spring and summer crops can now be planted. Here is a list of seeds and roots to be sown which will keep the market gardeners busy for some time: Carrots, parsnips, turnip, beet, lettuce, endive, salsify, radish, rhubarb, asparagus, Jerusalem artichoke, French beans, runner beans of all kinds, peas, parsley, tomato, egg-plant, sea-kale, cucumber, melon, pumpkin, globe artichokes. Set out any cabbage plants and kohlrabi that are ready. Towards the end of the month plant out tomatoes, melons, cucumbers, &c., which have been raised under cover. Support peas by sticks or wire-netting. Pinch off the tops of broad beans as they come into flower to make the beans set. Plough or dig up old cauliflower and cabbage beds, and let them lie in the rough for a month before replanting, so that the soil may get the benefit of the sun and air. Top dressing, where vegetables have been planted out, with fine stable manure has a most beneficial effect on their growth, as it furnishes a mulch as well as supplies of plant food.

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## FLOWER GARDEN.

All the roses should have been pruned some time ago, but do not forget to look over them occasionally, and encourage them in the way they should go by rubbing off any shoots which tend to grow towards the centre. Where there is a fine young shoot growing in the right direction, cut off the old parent branch which it will replace. If this work is done gradually, it will save a great deal of hacking and sawing when next pruning season arrives. Trim and repair the lawns. Plant out antirrhinums (snapdragons), pansies, hollyhocks, verbenas, petunias, &c. Sow zinnias, amaranthus, balsam, chrysanthemum, marigolds, cosmos, coxcombs, phloxes, sweet peas, lupins; and plant gladiolus, tuberose, amaryllis, pancratium, ismene, crinum, belladonna, lily, and other bulbs. In the case of dahlias, however, it will be better to place them in some warm, moist spot, where they will start gently and be ready to plant out in a month or two. It must be remembered that this is the driest of our months. During thirty-eight years the average number of rainy days in August was seven, and the mean average rainfall 2.63 in., and for September 2.07, increasing gradually to a rainfall of 7.69 in. in February.

## Farm Notes for August.

Land which has been lying fallow in readiness for early spring sowing should now be receiving its final cultivation prior to seeding operations. Potato-planting will be in full swing this month, and in connection with this crop the prevention of fungoid diseases calls for special attention. Seed potatoes, if possible, should be selected from localities which are free from disease; they should be well sprouted, and, if possible, should not exceed 2 oz. in weight. Seed potatoes of this size are more economical to use than those large enough to necessitate cutting. If, however, none but large-sized seed are procurable, the tubers should be cut so that at least two well-developed eyes are left. The cut surfaces require to be well dusted with slacked lime, or wood ashes, as soon as possible after cutting. Where it is necessary to take action to prevent possible infection by fungoid disease, the dipping of potatoes in a solution of 1 pint of 40 per cent. formalin to 15 gallons of water, and immersing for one hour will be found effective. Bags intended for the subsequent conveyance of tubers to the paddock should also be treated and thoroughly dried. After dipping, spread out the potatoes and thoroughly dry them before re-bagging. Where the tubers are cut, the dipping is, of course, carried out prior to cutting.

Arrowroot, yams, ginger, and sugar-cane may be planted this month in localities where all danger from frosts is over.

Maize may be sown as a catch crop, providing, of course, that sufficient soil moisture is available.

Sweet-potato cuttings may also be planted out towards the end of the month.

Weeds will now begin to assert themselves with the advent of warmer weather; consequently cultivators and harrows should be kept going to keep down weed growths in growing crops and on land lying fallow, as well as on that in course of preparation for such crops as sorghums, millets, or panicums, maize, and summer-growing crops generally.

Tobacco seed may be sown on previously burnt and well prepared seed-beds.

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## Orchard Notes for August.

### THE COASTAL DISTRICTS.

The remarks that have appeared in these notes from time to time respecting the handling and marketing of citrus fruits apply equally to the present month. The bulk of the fruit, with the exception of the latest ripening varieties in the latest districts, is now fully ripe, and should be marketed as soon as possible, so that the orchards can be got into thorough order for the spring growth. All heavy pruning should be completed previous to the rise in the sap; and where winter spraying is required, and has not yet been carried out, no time should be lost in giving the trunks, main branches, and inside of the trees generally a thorough dressing with lime and sulphur wash.

Where citrus trees are showing signs of failing, such as large quantities of dead or badly diseased wood in the head of the tree, they can (provided the root system is healthy) be renovated by cutting back the entire top of the tree till nothing but sound healthy wood is left. This should be thinned out, only sufficient main limbs being left from which to form a well-balanced tree, and the trunk and limbs so left should receive a dressing of lime sulphur, or Bordeaux paste.

Healthy trees that are only producing inferior fruit should be treated in a similar manner, and be either grafted with an approved variety direct or be allowed to throw out new growth, which can be budded in due course. The latter method is to be preferred, and an inferior and unprofitable tree can thus be converted in the course of a couple of years into a profitable tree, producing good fruit.

Where orchards have not already been so treated, they should now be ploughed so as to break up the crust that has been formed on the surface during the gathering of the crop, and to bury all weeds and trash. When ploughed, do not let the soil remain in a rough, lumpy condition, but get it into a fine tilth, so that it is in a good condition to retain moisture for the tree's use during spring. This is a very important matter, as spring is our most trying time, and the failure to conserve moisture then means a failure in the fruit crop, to a greater or lesser extent.

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Do not be afraid if you cut a number of surface roots when ploughing the orchard, but see that you do cut them, not tear them. Use a disc plough and keep the discs sharp, and the root-pruning the trees will thus receive will do more good than harm, as it will tend to get rid of purely surface roots.

Planting of all kinds of fruit trees can be continued, though the earlier in the month it is completed the better, as it is somewhat late in the season for this work. The preparation of land intended to be planted with pineapples or bananas should be attended to, and I can only reiterate the advice given on many occasions—viz., to spare no expense in preparing the land properly for these crops—as the returns that will be obtained when they come into bearing will handsomely repay the extra initial expense. Growers of pineapples and bananas who send their fruit to the Southern markets should take more care in the grading and packing of such fruit, as their neglect to place it on the market properly means a big difference in price, and entails a loss that could be avoided had the necessary care and attention been given. The same remarks apply to the marketing of citrus fruits, papaws, custard apples, strawberries, cucumbers, and tomatoes, all of which are in season during the month.

The pruning of all grape vines should be completed, and new plantings can be made towards the end of the month. Obtain well-matured, healthy cuttings, and plant them in well and deeply worked land, leaving the top bud level with the surface of the ground, instead of leaving 6 or 7 in. of the cutting out of the ground to dry out, as is often done. You want only one strong shoot from your cutting, and from this one shoot you can make any shaped vine required. The spraying of vines for downy mildew is not compulsory, but an application eliminates black spot.

Fruit fly will make its appearance during the month, and citrus and other fruits are likely to be attacked. Every grower should, therefore, do his best to destroy as many flies as possible, both mature insects and larvae, the former by trapping or otherwise, and the latter by gathering and destroying all infested fruit. If this work is carried out properly, a large number of flies that would otherwise breed out will be destroyed, and the rapid increase of the pest be materially lessened. The destruction of fruit flies early in the season is the surest way of checking this serious pest.

Keep a careful lookout for orange-sucking bugs, and destroy every mature or immature insect or egg that is seen. If this work is done thoroughly by all citrus growers there will be far fewer bugs to deal with later on, and the damage caused by this pest will be materially reduced. Destroy all elephant beetles seen on young citrus trees, and see that the stems and main forks of the trees are "painted" with a strong solution of lime sulphur.

## THE GRANITE BELT, SOUTHERN AND CENTRAL TABLELANDS.

The pruning of all deciduous trees should be finished during the month, and all such trees should be given their annual winter spraying with lime sulphur. The planting of new orchards should, if possible, be completed, as it is not advisable to delay. Later planting can be done in the Granite Belt, but even there earlier planting is to be preferred.

Peach trees, the tops of which have outlived their usefulness and of which the roots are still sound, should be cut hard back so as to produce a new top which will yield a good crop of good fruit the following season in from fifteen to eighteen months, according to the variety.

Apple, pear or plum trees that it is desirable to work over with more suitable varieties should also be cut hard back and grafted. All almond, peach, nectarine, and Japanese plum trees should be carefully examined for black peach aphid, as, if the insects which have survived the winter are systematically destroyed, the damage that usually takes place from the ravages of this pest later on will be materially lessened.

Woolly aphid should also be systematically fought wherever present. The best all-round remedy for these two pests is spraying with black leaf 40.

In the Granite Belt the pruning of vines should, however, be delayed to as late in the season as possible, so as to keep the growth back and thus endeavour to escape late spring pests.

Where orchards and vineyards have been pruned and sprayed, the land should be ploughed and brought into a state of as nearly perfect tilth as possible, so as to retain the moisture necessary for the proper development of the trees or vines and the setting of their fruit.

**ASTRONOMICAL DATA FOR QUEENSLAND.**

TIMES COMPUTED BY D. EGLINTON, F.R.A.S., AND A. C. EGLINTON.

**TIMES OF SUNRISE, SUNSET, AND MOONRISE.****AT WARWICK.****MOONRISE.**

Date.	July, 1928.		August, 1928.		July, 1928.		Aug., 1928.	
	Rises.	Sets.	Rises.	Sets.	Rises.	Sets.	Rises.	Sets.
1	6.46	5.6	6.35	5.21	p.m.	p.m.		
2	6.46	5.6	6.34	5.22	3.29	4.50		
3	6.46	5.6	6.34	5.22	4.15	5.50		
4	6.46	5.6	6.33	5.23	5.6	6.52		
5	6.46	5.7	6.33	5.23	6.1	7.53		
6	6.46	5.7	6.32	5.23	6.56	8.55		
7	6.46	5.8	6.31	5.24	8.1	9.55		
8	6.45	5.8	6.31	5.24	9.0	10.57		
9	6.45	5.9	6.30	5.24	10.1	11.59		
10	6.45	5.10	6.29	5.25	11.1	...		
11	6.44	5.11	6.28	5.26	a.m.	1.7		
12	6.44	5.12	6.27	5.27	12.3	2.15		
13	6.44	5.12	6.25	5.28	1.4	3.19		
14	6.44	5.12	6.25	5.29	2.19	4.22		
15	6.43	5.12	6.25	5.29	3.23	5.20		
16	6.43	5.13	6.24	5.30	4.36	6.12		
17	6.43	5.13	6.23	5.30	5.33	6.53		
18	6.43	5.13	6.22	5.31	6.34	7.35		
19	6.43	5.13	6.21	5.31	7.32	8.5		
20	6.42	5.14	6.21	5.31	8.31	8.36		
21	6.42	5.14	6.20	5.32	9.0	9.6		
22	6.42	5.15	6.20	5.32	9.37	9.37		
23	6.41	5.15	6.19	5.32	10.9	10.10		
24	6.41	5.16	6.18	5.32	10.37	10.42		
25	6.40	5.17	6.16	5.33	11.17	11.19		
26	6.40	5.17	6.14	5.33	11.37	12.0		
27	6.39	5.18	6.13	5.34	p.m.	12.49		
28	6.38	5.18	6.11	5.34	12.5	1.42		
29	6.37	5.19	6.10	5.35	1.23	2.38		
30	6.37	5.20	6.9	5.35	2.58	3.38		
31	6.36	5.20	6.7	5.36	2.9	4.40		

**Phases of the Moon, Occultations, &c.**

The times stated are for Queensland, New South Wales, Victoria, and Tasmania.

3 July ○ Full Moon Midnight.  
 10 " ) Last Quarter 10 0 p.m.  
 17 " ● New Moon 2 0 p.m.  
 25 " ( First Quarter 12 38 a.m.

Perigee, 15th July at 1 6 a.m.

Apogee, 28th July at 10 6 p.m.

Mars will be passing Jupiter from west to east on the 3rd. The two planets will seem to be very near to one another for several nights, before and afterwards. A distance equal to the width of the Moon will apparently separate them a fortnight later. The constellation Aries will form the background till the end of the month.

The earth will be in aphelion on the 4th, when it will be three million miles further from the Sun than it was on 4th January.

Mars will be occulted by the Moon on the 12th about 1 p.m. at places a little south of Townsville, but somewhat earlier in Southern Queensland. The nearness of the Sun will prevent them from being a good daylight spectacle.

The conjunction of Jupiter and the Moon at 5 o'clock in the morning of the 12th will form an interesting spectacle, with Hamal, the principle star of Aries, as the nearest and brightest star to the northward.

The conjunction of Mercury with the waning Moon on the 15th, about an hour and a-half before sunrise, will be interesting. The groups of the Hyades and Pleiades in Taurus will be higher up in the sky and more to the northward.

Mercury will be at its greatest western elongation, 20 degrees on the 21st, and will be favourably situated for observation after sunset.

The conjunction of Saturn and the Moon will take place at 1 p.m. on the 28th, when both are below the eastern horizon.

A small star in Sagittarius will be occulted about 10.45 p.m. at places a little south of Townsville, and somewhat earlier farther south.

2 Aug. ○ Full Moon 1 20 a.m.  
 9 " ) Last Quarter 3 24 a.m.  
 15 " ● New Moon 11 49 p.m.  
 23 " ( First Quarter 6 21 p.m.  
 31 " ○ Full Moon 12 34 p.m.

Perigee, 11th August, at 2.54 a.m.

Apogee, 23rd August, at 4.42 a.m.

Epsilon Capricorni will be occulted on the 2nd about 8 p.m., and will form an interesting observation for those who have a telescope or binoculars, which will be required to see so small a star near the southern edge of the almost full moon.

About two-and-a-half hours later Kappa Capricorni will also be occulted, the exact time depending upon the position of the observer who may find it advisable to look for the star on the south-eastern side of the Moon ten or twenty minutes earlier.

The occultation of Jupiter on the 8th unfortunately will occur several hours before the planet will be seen above the eastern horizon.

For places west of Warwick and nearly in the same latitude, 28 degrees 12 minutes S., add 4 minutes for each degree of longitude. For example, at Inglewood, add 4 minutes to the times given above for Warwick; at Goondiwindi, add 8 minutes; at St. George, 14 minutes; at Cunnamulla, 25 minutes; at Thargomindah, 33 minutes; and at Oontoo, 43 minutes.

The moonlight nights for each month can best be ascertained by noticing the dates when the moon will be in the first quarter and when full. In the latter case the moon will rise somewhat about the time the sun sets, and the moonlight then extends all through the night; when at the first quarter the moon rises somewhere about six hours before the sun sets, and it is moonlight only till about midnight. After full moon it will be later each evening before it rises, and when in the last quarter it will not generally rise till after midnight.

It must be remembered that the times referred to are only roughly approximate, as the relative positions of the sun and moon vary considerably.

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VOL. XXX.

1 AUGUST, 1928.

PART 2

## Event and Comment.

### Science and Primary Industries.

QUEENSLANDERS had the pleasure recently of welcoming amongst them three distinguished scientists who have won world fame, each in his chosen field. The visit of each, brief as it was, must influence beneficially the primary industries of this State. Dr. Orr, of the Rowett Institute, Aberdeen, who was here in June, has carried out work in Scotland in the course of the past few years, the value of which to the pastoral industry it would be very hard to estimate or exaggerate. While in Brisbane, he expressed himself as amazed with the extent and value of the scientific work performed by officers of the Department of Agriculture and Stock. To him, in his own words, it was a revelation. He made no secret, however, of his conviction that the application in Australia to-day of knowledge on animal nutrition acquired since the war ended will soon give results that will convince our stockowners that their industry must reap richer rewards from scientific effort if they will only co-operate with the scientist in that work. Sir Arnold Theiler was also with us for awhile and will be in Australia for some months longer. It was he who built up the great veterinary research institute at Onderstepoort in South Africa. Sir Arnold has already seen in Australia plenty of scope for increased activity in veterinary work in both the cure and prevention of animal diseases. Before long we may expect him to give us the facts as he sees them, and when Dr. Orr has done

the same it is certain that definite lines will be laid down for all those who desire to raise our pastoral standards to follow. Our third visitor was Sir John Russell, Director of the Rothamsted Experiment Station in England and Director-designate of the Imperial Bureau of Soil Science, whose two Brisbane lectures are published at length in this issue.

### **Deterioration of Pastures.**

THE latest knowledge acquired in the course of a world-wide inquiry into pastoral problems bears out the fact that lack of phosphates in pastures is one of the principal causes of restricted fecundity and losses of young stock. Only recently it has been discovered that the availability of iodine in stock foods is of the utmost importance in animal husbandry. Sir Arnold Theiler has informed us that, in his opinion, two-thirds of our pastoral worries in the form of pests and parasites would disappear if the proper feeding of stock were generally practised. In support of this statement we might regard, as an example, the fact that the first sheep attacked by blowflies in a bad fly season are always the sick members of a flock. Wormy sheep suffer from the pest to a far greater extent than healthy sheep. Sir Arnold Theiler has come to Australia in response to an invitation from the Commonwealth for the express purpose of giving us the results of his many years' researches in veterinary science and through his activities the pastoral industry should benefit immensely.

### **Soil Fertility.**

SIR JOHN RUSSELL'S lectures on agricultural science were of the utmost importance to farmers. He pointed out to us that agriculture is not as prosperous as it should be in Australia, seeing that we have the soil and climate to produce almost anything. It is impossible to forecast how far our development will extend, he said, if the producers will only adopt the proper methods. There is scope, he added, for greater progress by using improved agricultural machinery and the breeding of better stock, by the cutting out of waste, and by generally increased production. Sir John paid a well-deserved tribute to the Australian Press for the amount of space given to agricultural matters. Our show societies, particularly the Royal National, he noticed were also doing excellent work in advancing rural industry.

### **A Noted Visitor's Defence of the Queensland Sugar Industry.**

ANOTHER visitor of note in the course of the month was Sir Ben. H. Morgan, chairman of the British Empire Producers' Association. In the course of a Press interview, he held out great hopes for the early expansion of Queensland's primary industries. Speaking in regard to the Australian sugar industry, Sir Ben. said that actually the Empire supplied the Mother Country with less than one-third of its requirements of sugar. "There is an unlimited market," he added, "for Queensland sugar if it can be produced at a price which will enable it to compete with the rest of the world. I realise that as yours is the only white-grown sugar you have a big handicap in regard to the cost of production, but that is not necessarily insuperable. Britain is at present giving preference by her Budget to Australian sugar, and we hope that in the next Budget this preference will be very substantially increased. Then there will be an entirely new outlook for the disposal of the surplus sugar of Queensland. In England we realise that you have in Queensland some of the finest sugar country in the world. I do not want to say a word as to your labour conditions until I have been over your canefields and have seen for myself the actual position. If you can compete in producing sugar at a price approximate to world's parity there is no limit to the development that can be carried out in sugar production in Queensland. We are anxious to stimulate the

production of sugar within the Empire. It is not beyond the wit of those engaged in the industry to find some means of taking the place of the Cuban sugar-growers who, to a large extent, supply the British market. There are three by-products which undoubtedly will assist the industry in Queensland very much in the future in the direction of making the industry more profitable, and thus bringing it nearer to the point at which it can compete on the world's market. These by-product industries are the manufacture of megass board, the manufacture of power alcohol, and the conversion of megass into pure cellulose for the manufacture of artificial silk, or the best qualities of paper. The last is a new process which has just been devised, and a small factory has been established in Germany with the view of conducting practical tests. From all reports there is great hope for this industry, but it will take time to develop it. These by-product industries ought to contribute a great deal to reducing the cost of producing sugar, providing that they are manipulated by the owners of the sugar mills." Quite spontaneously Sir Ben. added: "Since my arrival in Australia I have seen in the Press of the Southern States a number of attacks made upon the Australian sugar policy. Most of these attacks have been based on the relative retail price of sugar in Australia as compared with other countries. These attacks completely fail on such a comparison, for a review of the average price of sugar in Australia over a period of years will show it to be as low as in Great Britain, or any other free market. In addition, you have your nucleus supply of an essential commodity; you are giving employment to your people; and you are maintaining your White Australia policy. I am surprised that this propaganda should be allowed to continue in Australia, in face of the facts that could be adduced to controvert it."

#### **Vocational Training for Country Children—Schools on Wheels.**

**B**RINGING technical training within reach of country children is part of Queensland's progressive educational policy. To enable this to be done, travelling manual training schools and travelling domestic science schools, housed in specially built railway carriages, have been provided. The schools remain in one centre for about seven weeks, during which time the children go through a course of intensive training. Classes for grown-ups are also provided. Speaking at a recent official function, Mr. McKenna, the Under Secretary for Public Instruction, stressed the obligation of giving equal chances, as far as possible, to every child in the State. The problem, he said, was a difficult one, but when they had another domestic science school and manual training school on the railway, they would be able to provide for every part of the State that could be reached by rail. It was difficult to estimate the real value of these schools, he added. The teaching of manual dexterity was a very great asset to children, even if they desired to enter the professional ranks afterwards. Big changes in the educational system had been forecasted by his Minister, Mr. T. Wilson. It meant that every boy at the age of twelve years would receive vocational training, and every teacher that went through the teachers' training colleges would take either a course in manual training or domestic science training. In the bigger centres of population special vocational schools would be opened for the children. Queensland children were the best in the world, and on that foundation they based their education system. In the course of an address at the same function, Mr. J. D. Story, I.S.O. (Public Service Commissioner), maintained that the country child was not getting any more than he was entitled to get. Over 40 per cent. of the breadwinners of to-day were connected with primary production and the main wealth of the State came from primary production. Queenslanders were never inclined to praise themselves, and in that respect the Americans smiled at them. But Australia, and Queensland in particular, was leading the way in many things. In no State in the Commonwealth were they doing more for the education of the country children than in Queensland. He paid a tribute to the Country Women's Association for the valuable work they were doing. There was a labour of love, which was done at great expense and often inconvenience.

## Bureau of Sugar Experiment Stations.

### GRUB DAMAGE AT YURUGA.

*The following report (9th July, 1928), submitted by Mr. J. H. Buzacott, Assistant to the Entomologist at Meringa, has been received by the Bureau of Sugar Experiment Stations:—*

Grubs of the greyback cockchafer have done a lot of damage in the Yuruga district this season. They have been very freely operating in cane lands in close proximity to scrub, and it was noted that the scrub there abounded in favourite feeding trees of the adult beetle.

Evidently many of the grubs had already gone down deep into the soil preparatory to turning into pupæ, but at the same time there were quite a number which had only recently moulted into the third stage, and even one late second-stage grub was seen.

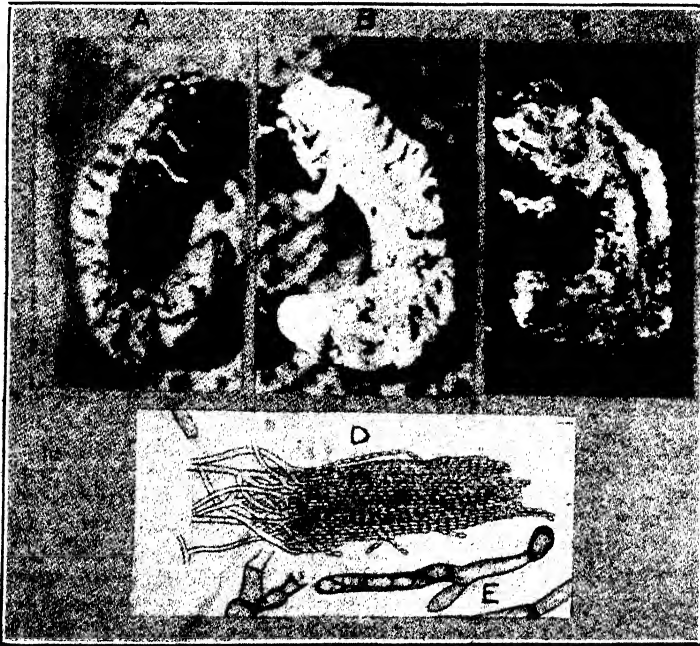


PLATE 12.—GRUBS OF THE GREYBACK CANE BEETLE KILLED BY GREEN MUSCARDINE FUNGUS.

A.—Stage 1, body filled with roots of the fungus, hardened internally. B.—Stage 2, body covered with white fungus growth of hyphæ. C.—Stage 3, body encrusted with green masses of spores. D.—A prismatic mass of spores,  $\times 160$ . E.—Spores germinating,  $\times$  about 700.

#### Recommendations.

At such a late period, when most of the damage has been done, it would not be profitable to fumigate, but should any farmer desire to do so next year, full particulars of how to go about it will be found in a special pamphlet on the subject, written by Mr. Jarvis, Entomologist at Meringa, near Cairns, and any further information desired will be willingly supplied by the Bureau on application to the Meringa Sugar Experiment Station.

Feeding trees of the adult beetle should be felled as far as possible in the scrub near cane fields, and of these trees the most important are—Figs of all kinds (*Ficus*

sp.), Moreton Bay Ash (*Eucalyptus tessalaris*), She Oak (*Casuarina* sp.), also any other trees on which the beetles are noticed to congregate in numbers during the fighting season.

The collection by hand of grubs and beetles is also strongly recommended, and for this purpose the establishment of a Pest Destruction Board to pay for the specimens collected would be advisable.

All insectivorous birds should be strictly preserved and encouraged, and of these the most valuable to the cane farmer are:—The Straw-necked Ibis (*Carphibis spinicollis*), the Indian Myna (*Acridotheres tristis*), the Peewit (*Grallina picata*), and the Jackass (*Dacelo Leachii*).

Good cultivation also helps by promoting healthier growth of the cane and thereby enabling it to better withstand the ravages of the grubs.

### CANE CROP PROSPECTS.

The Director of the Bureau of Sugar Experiment Stations, Mr. H. T. Easterby, who has been visiting officially the sugar-cane areas of Cairns, Babinda, Innisfail, South Johnstone, Mackay, and Bundaberg, has returned to Brisbane.

It is now evident, Mr. Easterby informed us, that the huge sugar crop predicted earlier in the year is not likely to materialise, and the yield will probably not be any better than that of last year. This depreciation has been caused in some districts by excessive rains, and in others by the early arrowing or tasselling of the cane which puts a period to its growth. Grubs have also caused much damage in the North this year. In some parts of the far North cane cut late last year, and only 2 ft. or 3 ft. high, is arrowing, and the anticipated extra growth of such cane which would be harvested later in the season cannot now be hoped for. Many of the mills have reduced their estimates; others must follow suit. Much cold weather had been experienced early this year, and even at Innisfail slight frosts had been reported in lowlying places.

In spite of climatic drawbacks, however, the crop should be a good one, and the various mills north of Townsville were all working steadily and crushing large weekly tonnages of cane.

The Mulgrave Mill has just finished the erection of a large new sugar store, and can now provide for from 7,000 to 8,000 tons of sugar in the event of shipping trouble. A new chimney stack has been built to replace the one destroyed in last year's cyclone. New electric motors, pumps, and crystallisers have also been installed, and it is proposed to add a fourth crushing mill next season. The mill management are to be complimented on the general efficiency of the plant. Rat destruction in the canefields is being systematically pursued with the aid of Barium biscuits, which are specially baked and distributed by the mill at an exceedingly low cost.

It is always pleasing to note the progress of local secondary industries, especially when these aid in the consumption of sugar. The recently erected North Australian Brewery at Cairns is now achieving considerable success. The wages paid amount to over £8,500 per annum; 2½ tons of refined sugar are consumed every week. Local timber is used for casing and barrels, and Bowen and Mount Mulligan coal for steam purposes. Tasmanian hops, South Australian barley, and Victorian malt are utilised, the aim of the company being to use everything Australian.

The Babinda cane areas, especially those on the Russell River, are looking well; some grub damage has occurred in places, and a good deal of the cane cut late last year is already arrowing, which must reduce the total crop.

Practically all the cane in the Innisfail district and most of that on the Herbert River has already arrowed. The cane on the Johnstone River is not so far forward as at this time last year. The crops on the Tully are good this season, and the mill is now getting well ahead with the crushing after the strike delay.

The Mackay district also will not realise its anticipated tonnage due to excessive rains and early arrowing of the cane.

At Bundaberg the crop has not been affected so much by arrowing, and the mills expect to crush their earlier estimates.

The annual field days of the Mackay, South Johnstone, and Bundaberg Experiment Stations were held during the Director's visit North, and in each case were highly successful, large crowds of canegrowers attending. The machinery exhibits

were of an excellent order, and proved of much interest. Displays of typical cane diseases and insect pests aroused considerable attention.

A visit was also paid to the Harbour Board's plant at Townsville. Considerable improvements have been made recently. The Jetty wharves are now brilliantly lit with electricity, and are being extended by another 650 ft. A large store with mechanical means of handling sugar has been erected, and it is now possible to store about 6,000 tons of raw sugar; provision for the coaling of large vessels is also being carried out.

## ENTOMOLOGICAL HINTS TO CANEGROWERS.

By EDMUND JARVIS, Entomologist.

### How Growers can Keep an Eye on the Weevil Borer.

Now that cutting is in full swing growers have an opportunity of locating the whereabouts, and of determining the degree of damage done to their cane by the weevil borer *Rhabdocnemis obscurus* Boisd. By examining a "rake" of cane before it leaves the field the presence of this insect can at once be detected, as at such times the tunnels of the beetle—which appear in transverse section at the cut ends of affected sticks—are very conspicuous. By pulling out such canes from the trucks the extent of the injury is easily detected; and although often confined to a few inches of the basal portion, may extend half way, or even throughout the entire length of a stick. The occurrence of borer infestations should be carefully noted and communicated to the Entomologist at Meringa without delay.

Tachinid parasites of this weevil will be liberated by the Sugar Bureau free of cost on such affected areas, on the condition that growers concerned will agree to leave at least an eighth of an acre of borer-infested cane sticks for these parasites to breed in. This area should be allowed to remain uncut for three months or longer, and must not be burnt.

*Note.*—One cannot expect to successfully establish these useful parasitic insects unless they be looked after by the grower and given a chance to multiply. Indiscriminate burning of the cane in which the flies have commenced to breed is one of the chief causes of failure to secure the permanent benefit which should result from liberations of this Tachinid.

### Horse Machine for Fumigating Cane Grubs.

Collaboration between the Entomologist and those growers who are interested in applied science is very desirable in a problem like that of cane-grub control; since such concerted action, while not unduly trespassing on daily activities of the cane farm, might go far towards minimising the injuries caused by our more serious cane insects, and so be of financial benefit to all concerned. At the present time attention is called to a machine for applying paradichlor. and other soil fumigants to grub-infested plantations, by means of which a man could treat from 3 to 4 acres of cane land per day.

This machine can be seen at Meringa Experiment Station, and growers interested in the matter are invited to inspect same at any time and have a chat over the question of soil fumigation, &c. Copies of the pamphlet recently published by the Bureau, dealing with the above-mentioned methods of combating cane grubs, are still available for distribution, and may be obtained gratis by applying to the Director of Bureau of Sugar Experiment Stations, Department of Agriculture, Brisbane.

### "White Ants" Attacking Cane Setts.

Isopterous insects belonging to the genera *Termes* and *Eutermes* are occasionally responsible for noticeable injury to newly planted cane setts, particularly when these are put in during dry weather. Unlike *Mastotermes darwiniensis* Frogg., which is our largest species of termite, the smaller "white ants" of the two above-mentioned genera seldom invade the growing sticks or cane-shoots above ground level; usually confining their injury to internal woody tissue of the setts, or to the sprouting eyes.

Control measures consist in dropping poison-baits in the planting drills at short intervals. A simple form of such bait can be made from white arsenic 1 lb., megass 33 lb., molasses 10 to 15 lb. Mix the arsenic in about 2 quarts of water, and while stirring briskly to keep it from sinking to the bottom gradually add the molasses, stirring continually until it has thickened sufficiently to hold the poison in suspension. Then stir in the megass, mixing same uniformly with the poisoned molasses.

## CANE PESTS AND DISEASES.

*The Southern Assistant Entomologist, Mr. R. W. Mungomery, has submitted the following report to the Director of the Bureau of Sugar Experiment Stations, Mr. H. T. Easterby, for the period June to July, 1928:—*

### Educating Farmers in Entomology.

Attention was called in a previous report (see "Australian Sugar Journal," June, 1928, page 163) when dealing with the question of cane grub parasites, to the importance of these friendly organisms, the results of their work being especially noticeable in the absence of bad grub damage on many of the Woongarra red volcanic soil farms. It would appear that whilst no damage of any great economic importance is being done in these parts, at the same time a balance exists in the ratio of host to parasite whereby any small increase in the numerical strength of the host is soon counteracted by a correspondingly small increase on the part of the parasites or predatory insects, so that for many years past this balance has been maintained and cane grubs have not been able to increase to the extent that they have warranted the institution of repressive measures in the abovementioned area.

This happy state of affairs would be welcomed in the Isis and other districts where cane grubs are present in numbers sufficient to do appreciable damage and cause some alarm. In the Isis district, it will be remembered, grubs are collected and paid for at the rate of 1s. per quart, and without wishing to discourage such collecting of grubs, I know that, unfortunately, too often many of our beneficial insects are included amongst those pests which are taken to the receivers to be destroyed and recorded for the purposes of payment. This, I have actually witnessed in the course of my visits from farm to farm, and I would suggest that, owing to the continual setback received through these parasites and predatory insects being destroyed, this is probably one reason why they are not so numerous there as the same species are in other places. Time and the extent of the protection afforded these parasites in the future will show whether this suggestion will prove correct or not.

No doubt in most cases the destruction of parasites has been carried out in complete ignorance of their true value, and when such glaring instances have come under my notice requests have been made to allow these insects to remain unmolested in the soil. However, it will be evident that it is not possible for the entomological staff to exercise a supervision over such collections and advise each collector individually in this manner. Therefore they are being approached through the receivers, each of whom will be made familiar with these beneficial insects, and receive instruction in the economy of the several species. In this connection Mr. Bates visited the Isis district recently, and exhibited to many of the receivers there the various parasitic and predaceous insects which attack our common cane grubs. Unfortunately, continued wet weather and the absence of some of the receivers from the district did not permit of all being visited, but those whom it was not possible to see then will be called on later.

It is to be hoped that these receivers will pass on this information to the collectors, and the position will then remain in the hands of the receivers. So it may come about that, by affording every opportunity for these beneficial insects to increase, the same favourable balance may be set up between host and parasite, such as now exists in the Woongarra district.

### Young Cane Grubs Active.

Cane grub attack, in the case of those species having a two-year life cycle, becomes noticeable chiefly from the month of September onwards throughout the summer, when the third stage grubs, having just moulted from the second stage, attack the cane roots very ravenously.

Damage in many parts has this year shown up as early as May, when it was seen that younger second stage "furfuracca" grubs had succeeded in eating out portions of a block of February plant cane. When such newly-planted sets have been destroyed in this manner, soil fumigation is then of little practical benefit, the best plan being to plough out and plant again, care being taken to handpick the grubs. Investigations are now being pursued relative to the possibility of poisoning these grubs, and experiments in this direction will be carried out during the next period of grub activity.

*The Director of the Bureau of Sugar Experiment Stations (Mr. H. T. Easterby) has received the following Report for the month ended 12th July, 1928, from the Assistant Entomologist at Mackay (Mr. A. N. Burns):—*

**Occurrence of Cane Butterfly (*Melanitis leda bankia* Linn.) in Mackay District.**

For some weeks past this insect has been plentiful throughout the district, especially in cane-fields situated in low-lying areas or adjacent to creeks and gullies. The butterflies do not fly readily in the day time unless disturbed; they then usually fly for a short distance only, settling amongst trash, dead leaves, &c., with the wings folded over the back. Unless watched closely when settling they are extremely difficult to detect, the undersides of their wings being the colour of dead leaves, thus harmonising with their surroundings. On account of this protective colouration when at rest, this insect is sometimes called the "Ghost Moth" by farmers in Southern Queensland and in the northern coastal districts of New South Wales.

Contrary to the general rule, this butterfly flies normally at and just after dusk. It measures about 3 in. across the expanded wings, and is coloured as follows:—

**Forewings, above.**—From base to half-way to outer edges dark reddish brown, then a lighter orange brown patch in which is another black marking enclosing two white (lightly suffused purplish) spots, the upper one of which is the larger. Apex and other edge broadly dark smoky brown-black. Outer edge of wing just below apex, with a small blunt tooth.

**Forewings, beneath.**—Uniformly some shade of dark brown, brownish black, or smoky black; (undersides of individual specimens vary very considerably) sometimes suffused greyish or purplish; barred or irregularly mottled or striated with darker markings.

**Hindwings, above.**—Basal and lower central area, dark reddish brown suffused blackish; remainder of wing to edges dark smoky brown, almost black; outer edge bearing a blunt tooth (slightly curved upwards) at lower angle.

**Hindwings, beneath.**—Uniformly some shade of dark brown, brownish black, or smoky black; sometimes suffused greyish or purplish, and irregularly striated or mottled with darker markings. In some examples two or even more small ocelli (eye spots) occur near the outer edge of the wing. These are usually most numerous near the lower portion of the wing.

There are two very distinct forms of this butterfly, the wet season form (described above) and the dry season form (*M. leda barnardi*). Dry season examples are considerably smaller than those that occur during the wet season; the wings are of a lighter brown colour, and are not so conspicuously toothed. The underside of the wings is also very different in this form, being of a greyish, pale yellowish brown or light ochreous colour, thickly striated with darker markings, almost giving the pattern of finely-grained wood. A number of clearly defined black circled ocelli (eye spots) also occur near the outer edges of the wings underneath in this form.

The eggs are pale creamy green in colour, and are laid in rows or small groups of numbers varying from two or three up to twenty or more on the undersides of young cane leaves. Just before hatching the eggs turn almost black in colour. The period occupied in incubation varies according to the season of the year; in April, eggs at the Laboratory took from three to four days to hatch. This period would be slightly shorter in the midsummer months, and longer at the present time (July).

The young caterpillars measure about  $\frac{1}{4}$  in. long when just out of the egg, and are pale creamy green with black heads. From examples bred at the Laboratory, the approximate times spent in each instar (the period between each moult) was as follows:—

- In the first instar, 9-10 days.
- In the second instar, 5-6 days.
- In the third instar, 7-8 days.
- In the fourth instar, 7-8 days.
- In the final instar, 8-10 days.
- Total larval life, about 40 days.

After the first day or two after hatching from the egg the caterpillar's body becomes bright green; the colour of the head, however, remains black till after the first moult.

The fully-grown caterpillar measures about 1½ in. in length, and is of a clear plant green colour; the whole body surface has a shagreened appearance, due to the presence of many minute tubercles. The general shape is cylindrical, tapering towards each extremity. The anal end of the body is produced into two pointed protuberances which extend a little beyond the last pair of claspers. The head is large and green in colour, with two erect horns projecting upwards. These are dark brown in colour, and the brown continues down the front of the head below the horns, forming two fairly broad longitudinal bands. These horns, also the head, carry numerous long brown fine hairs.

During the first three instars these caterpillars are gregarious, as they become fully grown, however, they separate and feed singly.

The pupa or chrysalis is translucent apple green in colour, and is about ¾ in. long. It is suspended by the tail usually to the underside of a cane leaf, where its green colour makes it very difficult to find. The time occupied in this stage is variable, being governed by the season of the year; it is as short as eight days in the summer months, and from two to three weeks in the colder months.

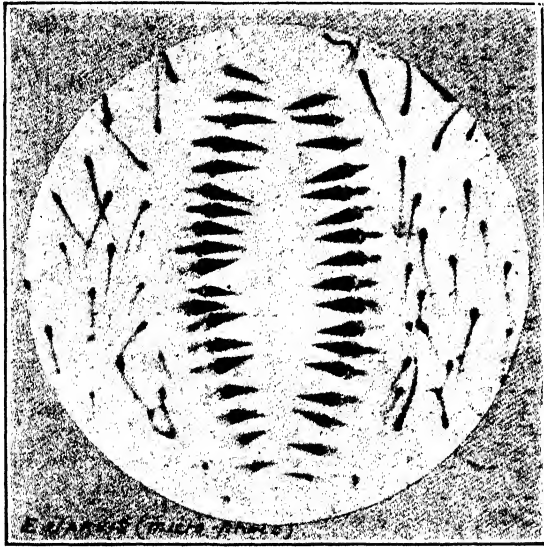


PLATE 13.

Arrangement of spine-like bristles on ventral surface of anal segment of grub of *Lepidiota grata* Blkb. (highly magnified).

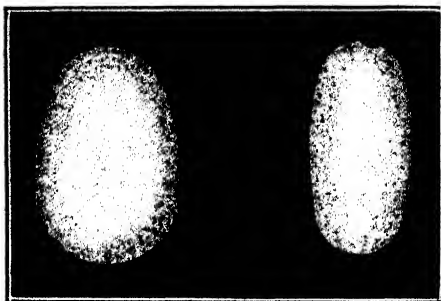
This insect is controlled naturally by both Dipterous and Hymenopterous parasites which affect the larval stages; recently at the Laboratory large numbers of a species of small Braconid (as yet unidentified) wasp were bred from larvæ collected in the field. Fully 75 per cent. of these larvæ were found to be parasitised. As many as fifty of these small parasites emerged from one caterpillar, and of these only 6 per cent. were males.

This cane insect rarely occurs plentifully enough to call for control measures. The writer, however, observed large numbers occurring over a fairly large area near Gordonvale (North Queensland), where the injury to the cane leaves could be seen for a considerable distance. Should control measures be called for at any time, a spray consisting of a lead arsenate in the proportion of 1 lb. to 25 gallons of cold water, and applied to the leaves with a hand or orchard spray pump, will soon destroy any larvæ that may be feeding.

**Frenchi (*Lepidiota frenchi* Blkb.) Grubs Going Deeper into the Soil.**

Both second and third stage grubs of this cane beetle have now ceased feeding, and have burrowed deeper into the soil to form their cells. The second stage grubs will remain quiescent till about next September, when they will moult into the third stage and recommence feeding at cane roots. Growers who observe their cane wilting from grub injury in September, October, or even November, can be sure that the injury is not due to greyback grubs, as this species does not injure cane roots till January or February, and it is usually March at the earliest before the cane shows signs of wilting. In instances therefore, where damage shows up in the above-named months (September, October, &c.), "frenchi" grubs will be practically certain to be present under the stools. Where necessary to fumigate, this should be carried out immediately that any injury is visible. These grubs usually occur in "patches," and frequently the same local area is affected year after year, so growers should familiarise themselves with the portions of their farms where these grubs usually occur, and then before any injury is apparent, dig under a few stools, and, if the grubs are found in any numbers, fumigate the stools.

The grubs at present in the third stage now in their cells will remain dormant for several weeks before actually changing into pupæ. This inactive period of the grub's life is termed the pre-pupal stage. The actual time spent in the pupa is comparatively brief, lasting sometimes a little less than a month, sometimes a little longer, according to the season.



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PLATE 14.

Fig. 1.—Scale from a wing-case of *Lepidiota grata* Blkb. (magnified about 360 diam.).

Fig. 2.—Scale from a wing-case of *Lepidiota rothei* Blkb. (magnified about 360 diam.).

The beetle freshly emerged from the pupal skin is soft, it therefore remains—sometimes for a couple of months—in its old pupal cell to "harden" and wait till the first heavy summer rains which render conditions suitable to enable it to burrow upwards and escape from the soil.

**Large Moth Borer (*Phragmatiphila truncata* Walk.) in Cane Sticks.**

Examples of this insect are continually coming under notice in soft canes (Clark's Seedling, &c.) growing in low areas. Now that the cutting season is commencing, growers should be on the look out for the occurrence of "dead hearts" and wilting of the central leaves of the young ratoons, also the young plant cane. On the first indications of yellowing of these central leaves, the affected shoots should be cut off well below the ground level, and destroyed by burning. If left till the central portion of the shoot is wholly dead, the borer caterpillar will have probably left that particular shoot and entered another.

Several shoots in a single stool can be accounted for by one borer caterpillar, hence may be seen the desirability of cutting out any shoots containing larvæ. Several shoots eaten out of stools, if only here and there, will eventually result in the loss whilst young of a good many sticks of cane in a row. If the infestation should be at all bad, these killed shoots if they had grown into matured cane sticks would have probably weighed several tons, taken over a whole cane field.

## CANE PEST COMBAT AND CONTROL

*The Director of the Bureau of Sugar Experiment Stations (Mr. H. T. Easterby) has received from Mr. E. Jarvis, Entomologist at Meringa, near Cairns, the following report from June to July, 1928:—*

### How to Combat the "Giant Termite."

Although the so-called "white ant" of the Burdekin district—which may be said to rank as a cane pest of primary importance—has claimed our attention from time to time during the last few years, it still continues to be responsible for considerable damage in certain localities.

It is encouraging to learn, however, that according to recent reports its range of occurrence does not appear to have noticeably increased—a fact which may, perhaps, be due to the practice of better methods of cultivation on areas which formerly were badly affected, combined with more or less systematic attempts by the growers to combat the activities of this pest. In view of the interest taken in the matter by Burdekin growers, and the economic possibilities of the species in question, the following recommendations regarding approved methods of controlling such formidable insects will be appreciated.

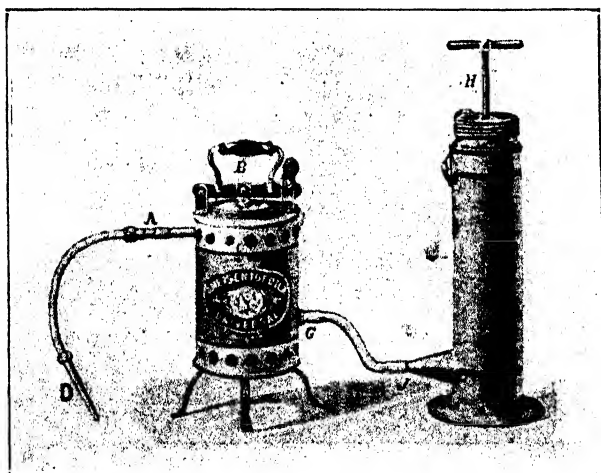


PLATE 15.—"UNIVERSAL ANT EXTERMINATOR"  
(Stands about 33 inches high.)

Used for destroying the Nests or Termitariums of "White Ants," by pumping fumes of sulphur and arsenic into the underground galleries of same.

### Locating the Nest or Termitarium.

In most problems of this nature ideal methods are those which aim at getting at the source of the trouble, which, in the case of our greyback cane beetle, consist in efforts at capturing the females before they have had time to deposit their eggs; while in the present instance our first step should be an attempt to destroy the nest or termitarium—which contains the egg-laying mother or queen termite of the colony—from which the workers often travel long distances underground in search of suitable food.

The position of a nest can usually be found by tracing the path taken by the termites, and upon discovery the community should be destroyed, either by digging out same or by fumigating the spot. In the former case, when situated below ground level, it would be a good plan, after filling in with clean soil, to make a few injections of carbon bisulphide over the place with a Vermorel "Pal Excelsior Hand Injector" or a "Danks Injector," the fumes from which would kill the few termites still remaining in the nest or amongst the undisturbed subsoil. In the event of a nest being located in the stump or taproot of a large tree, which could not conveniently be grubbed out, the earth above same should be removed to a depth of about 12 in.,

and the infested wood treated with from  $\frac{1}{2}$  to 1 pint of a solution of paradichlor. dissolved in tar oil heated to about 120 degrees Fahr. and then diluted with two parts of water and poured into the termite tunnels. The affected spot should be at once covered with damp soil, slightly consolidated by pressure. In places where termites cannot easily be dug out or fumigated, it becomes advisable at times to lay down poison baits. A simple one, which has given success in the Dutch East Indies, is made from one part of Paris green (arsenite of copper) to 100 parts of sawdust. Another formula used by some of our Burdekin growers consists of white arsenic mixed with molasses and sprinkled around the nest or on termite-infested posts, stumps, &c.

One of the best and well-known remedies, however, is that of fumigating such communities with sulphur and arsenic by means of a special apparatus which is sold under the names of "Universal Ant Exterminator," and "Buckeye Ant Destroyer."

This appliance has been compared to a blacksmith's forge, the bellows being replaced by an air pump, by means of which a blast is driven through from J to G into the bottom of a small furnace B, and then upwards through a charcoal fire. When the furnace is in full force about 1 oz. of the poison powder is dropped on the fire and the lid closed. The poison is prepared by thoroughly mixing together flowers of sulphur and white arsenic in proportion of about 3 lb. of the former to 8 lb. of arsenic.

When applying same it is always advisable to pump the fumes into some main gallery or opening that is being used at the time by the "white ants." The heated poisonous vapour passed through the nozzle D (via the metal pipe A, and flexible iron hose), which is inserted into the ant hill.

Entomologists have stressed the importance of treating such nests or termitariums during the swarming period, while the internal system of galleries and passages has been thrown open by the worker termites for a few days, in order to permit the winged males and females to escape. At such times a maximum mortality is likely to result from prompt action, as the deepest ramifications of the nest can then be reached by the poison fumes.

It may be mentioned that this appliance for destroying "white ants" has been in use for the last fifteen years or more in Natal, where it is said there are no insects more destructive or so widely known as those belonging to the order Isoptera.

The conspicuous earthen mounds or termitariums built up by these insects are more easily treated than their subterranean nests. In addition to the sulphur-arsenic fumigant already described, a mortality of from 90 to 100 per cent. can often be obtained by the use of such fumigants as "Shell" benzine, calcium cyanide, and carbon bisulphide.

Experiments carried out at Meringa during 1926 with the first of these insecticides proved highly satisfactory.

The termitariums treated by us were those of *Eutermes vernoni* Hill (a species which attacks cane sets), and varied from 3 ft. to 5 ft. in height. In one instance half a pint of the benzine was poured into a hole 6 in. deep made in the top of the mound, which was then sealed with a piece of wet mud. Two days afterwards, when the termitarium was opened up, a mortality of 95 per cent. was noted. All of the surviving termites were soldiers, and the queen mother was found dead in her cell. Another nest, 5 ft. high, was treated with a pint of benzine, administered at a depth of about 2 ft. from the summit, and when examined ten days later a kill of 100 per cent. had occurred, and the odour of benzine still pervaded the interior of the mound. Two nests fumigated with calcium cyanide (flaked form) gave a 95 and 97 per cent. mortality, the dosage used being 2 oz., which was placed in one mound at a depth of 2 ft. 6 in., and in the other in a cavity at the top of the termitarium, both holes being afterwards sealed over with mud.

Carbon bisulphide is best applied by means of a tin funnel, the spout of which is inserted into a hole made at the top of the nest and the liquid poured through it. The funnel should then be at once removed, and the hole plugged to prevent upward escape of any fumes. Searching for subterranean nests of the Burdekin termite *Mastotermes darwiniensis* Frogg. often proves discouraging work, but should not on that account be neglected, seeing that the results obtainable by this control method are likely to be well worth any difficulties that may be encountered. It will be of interest to mention that control methods recommended in Brazil against *Leucotermes tenuis* Hag., which is considered to be their most important termite, consists in injecting into the nests carbolic acid, carbon bisulphide, benzine, or essence of turpentine.

## FIELD REPORTS.

*The Central Field Assistant, Mr. E. H. Osborn, has forwarded the following reports for the period 12th June to 12th July:—*

### PROSERPINE.

The mill was steadily crushing what the management hope will be a record crop of some 135,000 tons.

Local rainfall figures up to the end of June:—

	Inches.
January .. .. .	7.31
February .. .. .	24.13
March .. .. .	24.13
April .. .. .	5.91
May .. .. .	1.23
June .. .. .	1.05
	<hr/> 63.76

On account of so much rain in the earlier months only a limited amount of planting has been possible, the strike being medium.

The cane, although fair, did not show such good growth as in 1927; the ratoons especially being light. Good density returns were beginning to come in, the average weekly c.e.s. being just about 14 c.e.s. The chief cause of the lightness of the crop per acre was the excessive and continuous wet during the early months of the year. Proserpine, with the exception of the newer outside railway centres, has a proportion of low-lying and badly-drained land where water must lodge unless helped away. Upon such portions in particular the crops have suffered. Bedding-up in medium-sized beds has been carried out in many cases, but numerous headland drains that were totally inadequate to carry off the surplus water in particularly wet times were noticed. Again, it must be emphasised how very necessary such drainage is, and how it is absolutely impossible to grow satisfactory crops without it.

The large acreage of cane that was arrowing throughout the district was very noticeable.

### BANANA POCKET

This locality is still going ahead, and some good crops were seen, but these were not up to the generally high standard of the Banana Pocket cane, due again to the excessive wet; the ratoons in particular were backward. To facilitate harvesting operations, several of the growers have bought their own rails, and now have a horse-line right into their cane paddocks, with the result that they have their complement of trucks loaded and pulled out on the main line by 10 a.m. instead of being practically all day upon the job when carting direct. There are probably about 2 miles of such line in use now.

*Fertilising.*—Fertilising is becoming more popular, but there is room for much improvement.

Green manuring is carried out only to a very limited extent, although all the local soils would benefit greatly by its use.

Liming seems to be gaining favour. Its use on the very heavy soils, coupled with good drainage, should be of great benefit, but liming without adequate drainage is practically useless.

A small experiment under which molasses was used at the rate of some 2,000 gals. per acre upon some second ratoons—H.Q. 426 and M. 1900—shows them to be far superior in colour and general growth to any second ratoons in the neighbourhood.

*Pests.*—Grubs and borers seem to be more scattered in their attacks this season than formerly.

*Cane Varieties.*—The following figures, supplied by the mill management, emphasise how Proserpine has progressed during the past five years, for it shows how the percentage of better and sweeter varieties of cane has grown, the greater tonnage crushed, the heavier tonnage per acre, and the increased tonnage per individual grower in that period.

## PERCENTAGE OF VARIETIES.

	1923.	1924.	1925.	1926.	1927.
H.Q. 426 .. .. .	28.28	21.00	17.5	22.3	20.7
Q. 813 .. .. .	17.04	21.20	24.0	22.0	24.5
M. 1900 .. .. .	9.13	13.60	13.7	13.0	14.2
N.G. 1 .. .. .	8.33	13.1	18.7	19.4	20.2
E.K. 28 .. .. .	..	..	.04	.8	3.5
Malagache .. .. .	8.78	6.8	5.1	4.0	2.5
Striped Singapore .. .. .	3.59	1.7	2.4	1.5	1.2
Mixed Varieties .. .. .	9.98	13.1	7.9	8.7	7.6
D. 1135 .. .. .	4.43	4.1	3.9	1.6	.8
Goru .. .. .	9.54	5.4	5.3	3.6	2.6
Q. 1121 .. .. .	..	..	.3	.8	.2
Q. 116 .. .. .	..	..	.4	.3	.3
Q. 114 .. .. .	..	..	.5	1.0	.7
7R. 428 .. .. .	..	..	.1	.9	1.0

## YEARLY CRUSHINGS.

1923.	1924.	1925.	1926.	1927.
35,387 tons	64,741 tons	104,208 tons	72,000 tons	121,673 tons

## AVERAGE YIELD PER ACRE.

1923.	1924.	1925.	1926.	1927.
7.94 tons	15.2 tons	15.5 tons	9.8 tons	16.8 tons

## AVERAGE TONNAGE PER GROWER.

1923.	1924.	1925.	1926.	1927.
116.02 tons	217.3 tons	273 tons	192 tons	328.8 tons

The yearly rainfall, and the average c.e.s. per year, are also of interest, and are herewith given:—

Year.	Rainfall.	c.e.s.
1923 .. .. .	27.49 inches	13.75
1924 .. .. .	71.06 „	14.28
1925 .. .. .	70.32 „	13.9
1926 .. .. .	37.36 „	13.3
1927 .. .. .	79.59 „	14.3

## HOME HILL.

This area was visited early in July. Conditions then were dry, and a number of the growers were watering. Despite the dry spell some really fine crops of cane were seen, and the opinion seems general that the estimate of 150,000 tons should about be reached.

As the writer had noticed quite a lot of dirty cane going into Proserpine, it was pleasing to see that in most cases the Inkerman cane was clean and well topped. As usual the mill was doing excellent work and a fine supply of cane was available.

In answer to inquiries it was ascertained that while the average c.e.s. was about 14, some remarkably high individual analyses had been recorded, with numerous instances of 17.5 for H.Q. 426 and B. 208, whilst a very heavy crop of E.K. 28 went the surprisingly high figure of 15.8 c.e.s. for this variety so early in the season.

A large area of young cane was noticed varying from a first class to a medium strike. In several instances the ground was very lumpy. This was explained by individual growers as being the result of too much heavy rain beating the previously extra well worked ground quite flat, and later when the land was again worked, too many lumps were the result. Several such paddocks could not have been fit to plant, but the excuse was that as one has to pay a flat watering rate he cannot afford to let such a block out of cultivation. This is probably quite correct, but at Home Hill (as well as in many other cane districts) many growers will persist in cultivating bigger areas than they can manage except with much luck.

*The Southern Field Assistant, Mr. J. C. Murray, reports for the period 11th June to 11th July:—*

### BOOYAL.

In the Booyal district the cane making the best showing was the M. 1900 Seedling. Other varieties promising to cut good tonnages are H.Q. 285, D. 1135, Black Innis, and Q. 813.

Growers should pay careful attention to plant selection for these reasons: (1) Cane is maintained of good type if well-grown sets are selected; and (2) disease is checked if a survey is made before cutting. The word "sets" has been used; this is a Queensland term, and generally understood. The word "seed" should not be used, for it is not in common use, and has an unfamiliar sound to the grower.

The Booyal soils do not, on the whole, need such deep cultivation as the Isis soils. Farmers are advised not to cut down any more jungle (or rain forest) than they can possibly avoid. Well-timbered country generally means a country with a well-distributed rainfall. Another important phase of this is that these park-like belts of softwood, with the libellous name of "scrub," greatly add to the beauty of the landscape.

Growers in this district are advised to consider the use of wooden tramlines for haulage. A 3 by 2 hardwood tramline would last for years, be much cheaper than steel, and just as effective for horse work.

### MARYBOROUGH.

Heavy winter rains have checked considerably the cane in this fertile area. The tonnage, nevertheless, should be about the same as last year. The growers are wisely fertilising more than hitherto. This applies to all the cane districts. The work of manuring is carried on now entirely on investigations made of late years by the Bureau of Sugar Experiment Stations, and is, on the whole, very satisfactory.

The best cane variety in this district is Q. 813; H.Q. 285 is showing good crops also.

The river soil has been considerably affected by the recent floods, and is in an inferior condition. Light dressings of lime are recommended on river fields that are being ploughed this spring.

### PIALBA.

There are some very fair crops in the Pialba district, notwithstanding the soil has suffered a great deal from excessive wet.

Cane varieties doing well in this locality include H.Q. 285, Q. 813, M. 1900 Seedling, Q. 812A. There are two sports of Malabar which are making good growth also. When a "sport" of a variety is referred to, it is meant that the original cane has undergone a change, and this is generally indicated by a series of wide parallel stripes running the full length of the cane. Some sports, however, come from striped canes, and are themselves quite free of stripes. N.G. 40 Sport is one of these. Again, sporting may be observed by a number of obscure manifestations, such as resistance to disease, &c. However, in most cases, it is a striped cane appearing where the parent stool is unstriped. Sports, if planted, will always reproduce themselves, and are often higher in sugar content than the original though not so hardy.

**Readers are reminded that a cross in the prescribed square on the first page of this "Journal" is an indication that their Subscription—one shilling—for the current year is now due. The "Journal" is free to farmers and the shilling is merely to cover the cost of postage for twelve months. If your copy is marked with a cross please renew your registration now. Fill in the order form on another page of this issue and mail it immediately, with postage stamps or postal note for one shilling, to the Under Secretary, Department of Agriculture and Stock, Brisbane.**

## ENTOMOLOGICAL HINTS TO COTTON GROWERS.

By G. A. CURRIE, B.Sc., Entomological Branch.

A word in season just now regarding some insect pests of cotton may help to reduce the destructiveness of these pests during the coming year, and cotton-growers are advised of the desirability of whole heartedly observing the following recommendations:—

The corn ear worm which is well known to the cotton-growers as a destroyer of squares, flowers, bolls, and foliage, does considerable damage every year, but if certain precautions are adopted the losses inflicted by this pest will be much reduced.

A detailed description of all stages of this insect and its yearly life history are given in the bulletin "Cotton Growing in Queensland," published by the Department of Agriculture and Stock, and any cotton-grower desiring these details is referred to that publication.

In autumn and early winter the full-grown caterpillars descend into the soil under the plants on which they have been feeding and change into the pupal form in earthen cells. When warmer weather and spring rains arrive, adult moths emerge from the pupæ, pair, and lay eggs on weeds, which have sprung up after the rains.

Many experiments have shown that ploughing and harrowing the ground kills most of the pupæ in the soil. This ploughing has, of course, to be done before the moths have emerged about the end of August or September.

Obviously the advice at this point is *to destroy all the past seasons bushes early, and plough the fields in winter before moths are likely to have emerged, and so destroy overwintering pupæ*. This is especially necessary in the case of fields known to have been heavily infested with corn ear worm in the previous season.

During the season 1927-28 much damage was done by caterpillars hatching from eggs, laid by moths emerging from ratoon blocks, which had not been thoroughly cultivated. It is difficult to destroy all pupæ amongst cotton plants which are being ratooned, for many of the pupæ are situated near the roots, and even between the plants in a row so that only the most thorough cultivation can reach them. If any cotton is ratooned, this thorough cultivation to kill overwintering pupæ should be aimed at. On emergence in spring, moths lay their eggs on many weeds of cultivation and so breed up to enormous numbers ready to infest cotton or maize later on. The rate at which they breed can be imagined from the fact that each female moth may lay from 500 to 1,000 eggs during her short life.

The insect breeds continuously from September to about June in the districts inland from the coastal range, one generation following another. In the coastal districts breeding may be continuous throughout the year.

To counteract this breeding in spring all farmers should make a point of having no dirty fallows or weedy ratoon fields available as

breeding grounds for the first generation of caterpillars in September and October.

The spring generation is the one which has the most precarious outlook as to its feeding grounds, and so is the one most open to control by simply starving it out, as far as lies in the grower's power, by destruction of all spring weeds of cultivation.

When numbers have increased sufficiently to be destructive it is difficult to cope with the pest, as spraying or poison dustings, even if practicable, are expensive.

The situation can be summed up in general terms as follows:—

When ploughing is left till late and moths emerge in spring from infested grounds, they will lay their eggs on weedy fallows or dirty ratoon crops and increase rapidly in number so that their next and subsequent generations may be destructive to maize, cotton, &c.

When, however, ploughing of all previously cropped land is done in winter, and all weeds are kept down in September and October, not only will most of the pupæ be destroyed in the soil, but those that do emerge as moths will have difficulty in finding suitable food plants for their caterpillars. This will make the first, and probably all, subsequent generations for the year much smaller and consequently less destructive than they would otherwise be.

Each successive generation of caterpillars may, if conditions are favourable, become larger than the previous one, so that the earlier the cotton crop comes to maturity the more probably will it escape the most destructive brood of caterpillars.

The rapidly growing tender young plant in its squaring stage is the most attractive stage to the caterpillars, so the sooner this stage is past the more chance it has of setting a crop of bolls before the caterpillars become most numerous and destructive for the season.

Cotton plants with a sappy luxuriant habit of growth have been observed to be more liable to attack by corn ear worm than those with a slower growth, and with a more fibrous nature.

The different habits of growth are seen to be correlated with soil and climatic conditions, but sufficient evidence has not yet been accumulated to give recommendations about choosing soil types with relation to immunity from insect attack.

Besides helping in the matter of cultural control there are some natural controlling agents, which the farmer can assist in their war against the corn ear worm.

Wild birds and domestic poultry take heavy toll of caterpillars, so that all insectivorous bird life should be encouraged, while domestic poultry should be allowed the free run of the fields whenever possible. Some of the most useful birds in this connection are ibis, pee-wees (magpie lark), butcher birds, wagtails, swallows, and martins, while the much maligned crow, though a mixed feeder, can be very useful on occasions.

There are fifteen known insect enemies of the corn ear worm and probably many more will be found. Little can be done by the farmer to assist most of these, but there is one at least that can be encouraged.

This is a reddish-brown wasp (*Polistes schach*). It is about an inch long and one and one-half inches from wing tip to wing tip. It nests in hollow trees, in the lee of large fence posts, in old sheds, and under verandahs. It preys on caterpillars, slashing them and sucking the juices, so it should be protected as far as possible.

In some parts of the world small huts or shelters are built to encourage wasps of this type to build their nests, and Queensland farmers should at least prevent the destruction of these wasp nests unless they are a source of annoyance.

The recommendations with reference to possible injury by corn ear worm can now be summarised as follows:—

- (1) *Cultivate early all soils which have grown crops the previous season so as to kill all overwintering pupæ in the soil before moths emerge in spring.*
- (2) *Keep all fallows and ratoon crops clean during the spring months so that no feeding grounds for the first brood of caterpillars of the season are available.*
- (3) *Plant cotton as early as possible so that the bushes will be well advanced before the pests have bred up to great numbers.*
- (4) *Protect and encourage wild birds which prey on insects, and wasps which destroy the caterpillars.*

In connection with pink boll worm control, the following general recommendations are reiterated:—

- (1) Destroy all previous seasons cotton bushes early; say, by middle of July.
- (2) Cultivate early to help to destroy pupæ in cracks in soil or amongst rubbish on ground.
- (3) Avoid ratoon or stand-over cotton which provides feeding grounds for the pests to carry them over the period before the annual cotton becomes available.

### RED-FLESHED CAPE GOOSEBERRY.

Mr. R. M. Wise, of Vadencia, Buderim, recently visited this office, and on that occasion exhibited for our edification a red-fleshed variety of Cape Gooseberry somewhat larger in size than the common variety which grows wild over a considerable portion of the scrub lands of this State. From subsequent inquiries made it was ascertained that the plant was identical with the Chinese Bell flower (*Physalis franchetii*), a dwarf plant frequently of straggling habit and about 2 ft. in height. The seed pods towards the end of the season are decidedly ornamental, as they change from yellow to almost scarlet, particularly the base half.

The specimen exhibited by Mr. Wise was particularly handsome, being striped a brilliant scarlet toning down to an almost bronze red. This plant is really an ornamental type of Cape Gooseberry, the fruit slightly larger than the common yellow variety. Its flesh is more solid and its flavour of a pleasing acidity. As a fruit for preserving, or for similar purposes, it should meet the public taste and is well worthy of further cultivation.

The water-colour drawing by Mr. I. W. Helmsing, of the Entomological Division, is a remarkably good illustration of the fruit as delivered to us by Mr. Wise, and represents the beautiful colouring of both fruit and seed pod.





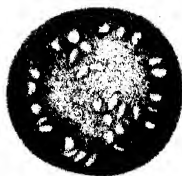
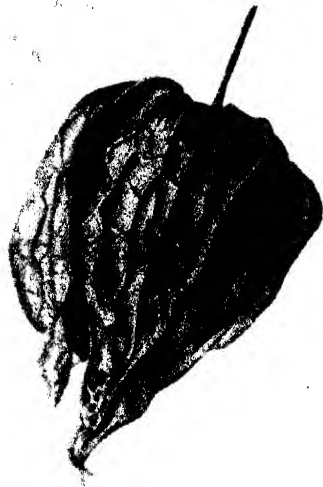


PLATE 16.—A NEW TYPE OF CAPE GOOSEBERRY (*Physalis franchetii*).  
(From a water-colour drawing by I. W. Behnsing.)



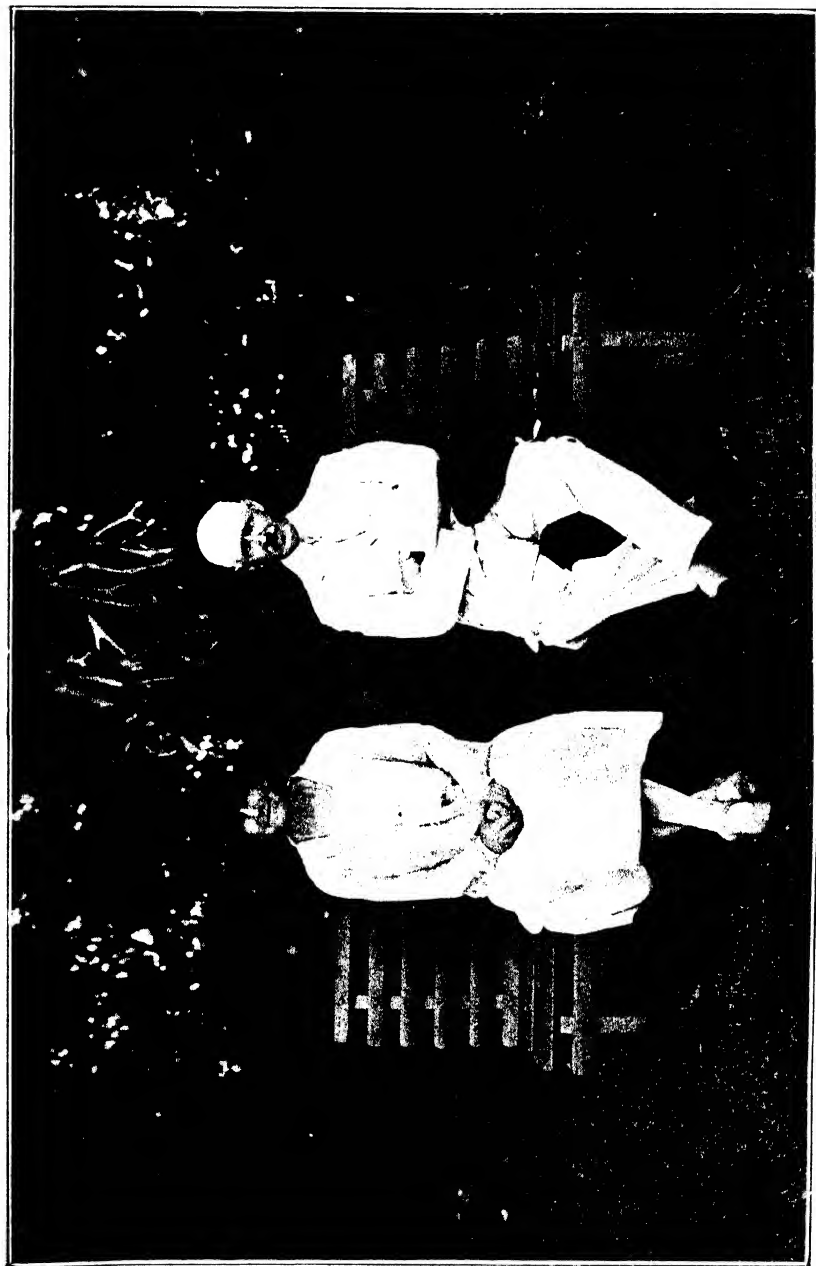
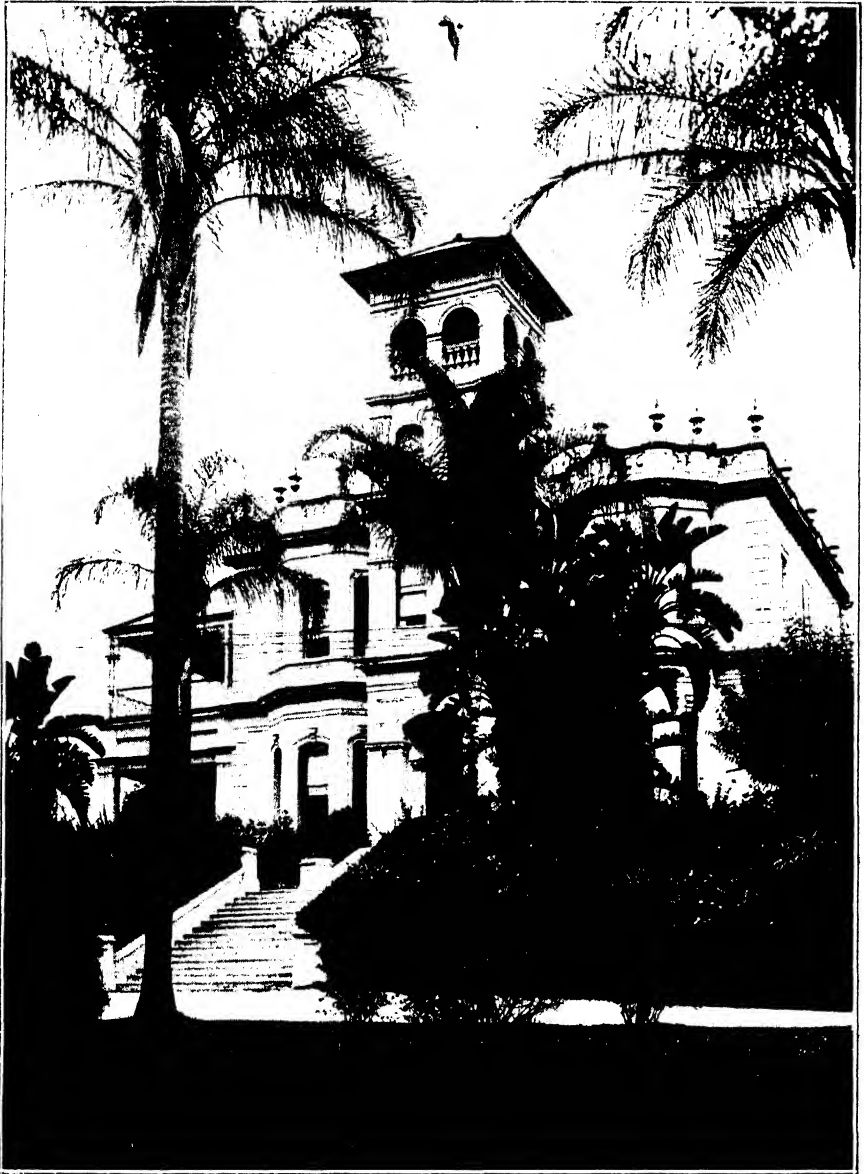


Photo: H. W. Mchibby, Dept. Agriculture and Stock.]

PLATE 17.—THEIR EXCELLENCIES SIR JOHN AND LADY GOODWIN IN THEIR GARDEN AT GOVERNMENT HOUSE.

woodland walks lined along the mountainous regions in ...



*Photo.: H. W. Mobsby, Dept. Agriculture and Stock.]*

PLATE 18.—THE QUEENSLAND HOME OF SIR JOHN AND LADY GOODWIN, Crowning the crest of one of the forested foothills of Brisbane's sheltering range. From the tower may be enjoyed a wonderful panorama of one of the most beautifully situated Capital cities of the Empire—a panorama of mountains, forests, city, river, and sea.



*Photo.: H. W. Mobbs, Dept. Agriculture and Stock.]*

PLATE 19.—UNDER THE CEDARS, GOVERNMENT HOUSE, BRISBANE.

The home of Sir John and Lady Goodwin is surrounded with lawns, always half in sun and half in deep, cool shade. Encircling these again is a natural unspoilt forest, a sanctuary for furred and feathered friends. Beautiful woodland walks along the contours through corridors of gums, and help in making the Government House

# A RECORD OF RURAL PROGRESS.

## SPEECH BY THE GOVERNOR.

His Excellency the Governor, Lieutenant-General Sir John Goodwin, K.C.B., C.M.G., D.S.O., opened the Third Session of the Twenty-fourth Queensland Parliament on Wednesday, 25th July, and in the course of his Speech he reviewed the progress of country life in the State, and forecasted legislation that will have an important bearing on our rural industries. Subjoined are excerpts from His Excellency's Speech which are of especial interest to the agricultural community.

### OPENING OF PARLIAMENT.

#### THE GOVERNOR'S SPEECH.

His Excellency, at the outset of his speech, said: "It gives me great pleasure to meet you at the opening of this, the third session of the twenty-fourth Parliament of Queensland. Since opening the second session of this Parliament on 24th August of last year, it has been my good fortune to travel over a considerable portion of the State of Queensland. In my various tours I have traversed more than 12,000 miles by road and rail, and the study of the many and varied conditions and industries of the country has been of intense interest, while the meeting with the people in both town and country districts has afforded me the greatest possible pleasure. Although even now I am acquainted with but a comparatively small portion of the State, yet my earlier impressions as to its amazing natural resources and future possibilities are more than fully realised. The cordial greetings which have been accorded to me everywhere have made a very lasting impression on me, and the expressions of loyalty to the throne and person of His Majesty have been universal. I invariably transmit such expressions of loyalty direct to His Majesty. I would take this opportunity of tendering to the people of Queensland, through you who represent them, my very sincere gratitude and thanks for the warm welcome which I have received from them in every part of the State which I have visited. I intend to use my utmost endeavours to extend my knowledge to every part of Queensland, and to become acquainted as fully as possible with all conditions, industries, and peoples."

#### The Sugar Industry.

His Excellency, after a brief reference to the satisfactory revenue account for the year ended 30th June, 1928, and to the ratification of the agreement between the Commonwealth and the States for the adjustment of Commonwealth and State financial relations, said that present indications pointed to the yield of sugar in Queensland for the current season being in the vicinity of 500,000 tons. The industry had made great progress during recent years. In 1920 the area cultivated for cane was 162,000 acres, while to-day some 300,000 acres were under cultivation, and the number of growers of cane had increased by 70 per cent. That the industry was proceeding on progressive lines was reflected in the amount of cane required to make a ton of raw sugar, which was now 7.5 tons as against 9.2 in 1908.

The principal agricultural products of Queensland, which had been brought under the system of co-operative marketing inaugurated by the Government, represented an annual value of approximately £12,000,000 sterling, which was two-thirds the value of the agricultural production of the State. The splendid season experienced in agricultural areas had brought about a greatly increased production, exceptional wheat yields being secured on the Darling Downs as a result of the favourable conditions prevailing in the spring. This year's maize harvest would be a good one, while the expansion of trade in the peanut industry was most marked. The past financial year had shown record returns in the dairying industry.

#### Wool and Cotton.

The total yield of cotton this season would exceed that of last season, despite serious losses experienced from severe floods and heavy rains at critical stages of

the development of the crop. Growers in the main cotton areas were optimistic as to the future of the industry, and it was considered that the acreage for the coming season would approximate that of the present season, and might even show an increase.

The recently constituted Board of Agriculture had made a survey of agricultural activities in the State, and plans were now well advanced towards their co-ordination. The wool industry was receiving careful attention from the Government. Over the past five years it had provided an average of about 60 per cent. of the exports from the State. Unfortunately, of late years the seasonal conditions throughout a large proportion of the sheep belt of Queensland had been unfavourable. Notwithstanding this temporary setback, it was gratifying to note that there were still 16,500,000 sheep depastured on the lands of the State. With the advent of good seasons, therefore, the State would soon be stocked again to its normal carrying capacity of 21,000,000 sheep.

### **Pastoral Development.**

Already a great amount of most valuable work had been accomplished by the Land Administration Board, which was appointed on 1st February. Grazing selection tenures exceeding 1,000 in number, and comprising an area of more than 10,000,000 acres, had been adjusted on the recommendation of the board; new leases for twenty-eight years had been granted, and moderate rents had been fixed in all cases.

The policy of the Government was to make available expiring pastoral leases for settlement by grazing farmers in economically sound areas. Already five large expired pastoral leases, covering an area of 550,000 acres, had been opened for selection, and all the land had been selected. A number of other expired or expiring pastoral holdings were now being subdivided, and would be released for settlement as early as practicable. While pastoral leases would not be renewed in respect of good quality sheep lands, situated near railways, consideration would be given to any pastoralist who was prepared to develop lands more remotely situated. Already eighteen pastoral development leases had been granted, comprising an area of nearly 6,000,000 acres.

Following on the report of the Beef Cattle Industry Commission, it was the intention of his advisers to introduce a Land Acts Amendment Bill to give effect to certain recommendations of the Commission in regard to land tenures.

### **The Dawson Valley Scheme.**

The Dawson Valley irrigation project had steadily advanced during the past year. Over a hundred settlers had taken up blocks comprising 15,000 acres, and many had already received substantial returns from their crops. Substantial progress continued to be made by the Prickly-pear Land Commission in the control of the prickly-pear pest. The Main Roads Commission had now completed 850 miles of road and over 12,000 lineal feet of bridges, and had 112 miles of road and 3,000 feet of bridges under construction, the present rate of road construction being approximately one mile per working day. The gross revenue derived from forestry during last financial year amounted to £642,587, as compared with £674,430 for the previous year, the cash surplus over all costs of the department, including new investments in reforestation, totalling £169,750. During the year over 1,000 acres of new softwood plantation were established, and 5,580 acres of hardwood and cypress pine forests treated for natural regeneration.

### **Extension of Education.**

Brief reference was made to the four travelling schools, the increase in the number of rural schools, and the development of project schemes and school clubs. It was the intention of his advisers, His Excellency said, to inaugurate in the larger centres of population a system of intermediate schools, into which pupils who had reached the age of approximately twelve years would be drafted, and where they would receive a course of super-primary education that would include training in the manual and domestic arts and in elementary science. The establishment of these schools would relieve the overcrowding which sometimes resulted from the rapid increase in population, and would secure manual dexterity while preparing the way for entrance into the skilled trades and into the various types of secondary schools.

Recognising the necessity for dealing more effectively with acute cases of eye trouble occurring among school children in the blight areas of the State, his advisers had decided to establish in Brisbane an ophthalmic hospital, where these cases would receive expert treatment.

The education of the children would receive attention while they were in the hospital. It was expected that the hospital would be in operation before the close of the current year. The system of dental inspection was also being extended, and arrangements were now being made for a travelling rail motor clinic.

### **The Sessional Programme.**

Among other proposals which would be brought before Parliament, added Sir John, would be the following:—

A Land Act Amendment Bill.

A Hospitals Act Amendment Bill.

An Aboriginal Protection and Restriction of the Sale of Opium Acts Amendment Bill.

A Traffic Acts Amendment Bill.

A State Children Acts Amendment Bill.

A Guardianship of Infants Amendment Bill.

A Main Roads Acts Amendment Bill.

A Farm Produce Agents Act Amendment Bill.

A Fruit Marketing Organisation Acts Amendment Bill.

A Primary Producers' Organisation and Marketing Act Amendment Bill.

A Stock Foods Act Amendment Bill.

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## **THE GROS MICHEL BANANA.**

By S. E. STEPHENS, Inspector, Diseases in Plants.

Some publicity has lately been given to the variety of banana known as the Gros Michel, also called, in different localities, the Fiji and the Jamaica. The variety is a tall-growing one, reaching as high as 25 ft. to 30 ft. when planted on suitable soil. The bunch is large and the fruit of an even grade and of the largest size.

Before a grower commits himself to an area of Gros Michel bananas he would be wise to consider the pros and cons connected with the growing of this variety.

In the first place, the land selected for growing them must be of the very best. Land which will grow only a fair average Cavendish banana will be quite useless for Gros Michel. The ideal land is a rich alluvial creek flat which has carried dense tropical scrub. Being subject to flood is no disadvantage provided it is only back-water which can drain off quickly. Bananas are only damaged by water when it lies on them for several days with the sun beating down on it.

Shelter must also be considered. Being a tall-growing banana it must be well protected from the prevailing winds by belts of scrub, preferably on three sides of the patch. The Gros Michel has several points in its favour, the chief ones being large bunches and large fruit. The fruit is also said to be of a superior carrying quality to the Cavendish, whilst the flavour is preferred by many people.

Whilst it is an advantage to have a consistently large grade of fruit there are a number of points which make the Gros Michel unsuitable for general cultivation at the present time.

Firstly it is subject to Panama disease—a disease which is known to be prevalent throughout the State, and which caused a large amount of havoc amongst the tall-growing varieties of bananas some years ago.

Being so tall it is impossible to prop a plant with a heavy bunch and consequently a number of bunches are lost through the plants falling out.

The bunch being so high from the ground makes it a difficult matter to treat for rust. A statement was recently made in the Press that the Gros Michel is not affected with rust, but this is incorrect. It is affected almost as badly as the Cavendish although perhaps not in quite such large numbers. The only method of treatment is to use a spray pump fitted with a long extension rod.

Harvesting the bunches is somewhat difficult to the beginner. The easiest method is to nick the stem of the plant on the side nearest the bunch, at a point as high as can be reached, with a sharp shovel. This will allow the top of the plant bearing the bunch to bend over slowly until it is within reach, when the bunch can be eased gently to the ground. The fruit is often so large that the novice finds some difficulty in packing it into the standard 1½-bushel case. To overcome the difficulty first pack a row of fruit down the centre of the case. This will raise the centre so that the two rows then packed in the ordinary way will just meet over the first row, making the centre of the pack hog-backed.



PLATE 20.—A FINE PATCH OF GROS MICHEL BANANAS—MR. P. MONAGHAN'S PLANTATION AT KENNEDY, NORTH QUEENSLAND.



PLATE 21.—TWELVE MONTHS' OLD GROS MICHEL BANANAS, SHOWING REMARKABLE DEVELOPMENT UNDER OUR NORTHERN CONDITIONS.

## QUEENSLAND'S WEALTH AND PROGRESS.

The Registrar-General (Mr. Geo. Porter) has made available the following facts concerning manufacturing in Queensland.

A factory, statistically speaking, is regarded as an industrial establishment employing four or more hands or using machinery worked by power other than horse or hand.

During the year ended 30th June, 1927, there were 1,877 of such factories in Queensland—a decrease of 20 on the number in the previous year 1925-6. On the average 48,133 hands (of which 40,493 were males and 7,640 females) were employed, as compared with 50,496 (42,525 males and 7,971 females) during the previous year. It is interesting to note that the percentage of females employed in 1926-7 was 15.9 as compared with 15.8 in 1925-6.

The employees mentioned above include working proprietors and clerks, &c., as well as manual workers. These have also been included in the following calculations.

The amount of wages paid was £9,588,138 for the year or £199.21 per employee, as compared with the wages bill of £9,821,960 or £194.51 per employee during 1925-6.

Goods to the value of £41,327,767 were produced during the year from raw materials worth £23,912,241. In 1925-6 the value of output was £45,900,668 and raw materials used £26,710,520. Output per employee was, therefore, £859 in 1926-7 and £910 in 1925-6.

The value added by process of manufacture—i.e., the value of output less materials used, fuel, light and power, repairs, &c.—was £15,320,068 for 1926-7 and £16,197,764 for 1925-6, an average of £318 and £321 per employee respectively.

The value of land and premises was £8,645,580 (1925-6), £8,155,604, whilst plant and machinery was valued at £16,043,679 in 1926-7 and £15,226,566 in 1925-6.

For purposes of comparison, the following list of principal articles manufactured is now given. 1925-6 figures in all cases appear in parentheses:—

Leather (lb.)	.. .. .	3,425,504	(4,002,757)
Soap (cwt.)	.. .. .	84,914	(94,267)
Bricks (1,000)	.. .. .	22,543	(24,733)
Meat, frozen, preserved, &c., at meatworks (lb.)	107,154,543	(215,846,728)	
Bacon and ham (lb.)	.. .. .	17,971,692	(18,013,086)
Butter (lb.)	.. .. .	49,054,847	(60,491,765)
Cheese (lb.)	.. .. .	9,243,279	(12,565,572)
Confectionery	.. .. .	£297,282	(£362,269)
James and jellies (lb.)	.. .. .	5,570,172	(5,038,934)
Pulped fruit (lb.)	.. .. .	373,642	(416,864)
Preserved fruit (lb.)	.. .. .	6,244,427	(3,853,051)
Flour (tons)	.. .. .	52,959	(61,587)
Bran and pollard (bush.)	.. .. .	2,082,538	(2,611,659)
Sugar, raw (tons)	.. .. .	457,914	(479,023)
Aerated waters (doz.)	.. .. .	2,682,822	(2,890,177)
Beer and stout (gal.)	.. .. .	6,675,966	(7,045,713)
Boots and shoes (pairs)	.. .. .	728,279	(767,104)
Timber, sawn (sawmills only) (sup. ft.)	.. .. .	129,780,650	(131,662,444)

## THE MINISTER IN NEW ZEALAND.

### AMONG THE STUD STOCK BREEDERS.

New Zealand has shown an expansion in the cattle-raising industry, especially in relation to dairying, that has few parallels in recent years. The favourable climate, co-operative organisation among producers, and close attention to breeding, selection, and the general principles of animal husbandry, have all contributed to the placing of the Dominion in the position of one of the largest exporters of dairy products in the world.

In the course of his tour through New Zealand early in the year, the Minister for Agriculture and Stock (Mr. W. Forgan Smith) came in contact with many of the leading Dominion stud stock breeders. He also saw the results of their skill and judgment, as expressed in the quality of animals running on their home pastures.

Through the courtesy of Mr. Forgan Smith we are able to reproduce photographs of some of the animals he saw on his tour, and the series now presented is selected from his interesting pictorial record of his journeyings through the Dominion.



[Photo. : L. G. Hahn, Dunedin, N.Z.]  
PLATE 22.—THE CLYDESDALE IN NEW ZEALAND. "BRILLIANTSHINE" (BRILLIANT AGAIN—LADY SCOTLAND), 1ST AT THE  
NEW ZEALAND ROYAL SHOW, THE PROPERTY OF THOMSONS LTD., WAI-RONGOA STUD, DUNEDIN, NEW ZEALAND.



[Photo.: L. G. Hahn, *Dunedin, N.Z.*]

CLYDESDALE, "SCOTLAND'S VICTOR" (SCOTLAND'S VICEROY—BRILLIANT IV.), THE PROPERTY OF  
THOMSONS LTD., WAI-RONGOA STUD, DUNEDIN, NEW ZEALAND.



PLATE 24.—REPRESENTATIVES OF OCHTERTYRE STUD OF CLYDESDALES, ALLANTON, OTAGO, NEW ZEALAND.  
*Left to right* : Scotlan P's Douglas (imp.), (20682)—sire, Dunure Reserve (18718) ; g. sire, Bonon of Buchlyvie (11963) ; dam, Southley Lass (38684), by General Hunter (12161). Brunstane Duplicate (imp.), (2049)—sire, Dunure Footprint (15203) ; dam, Marsellaise (35946), by Mercutio (11431). All Scotch (1909) (imp. in utero)—sire, Scotland's Sample (20979) ; dam, Scotland's Queen (55047), by Dunure Endeavour (19419).

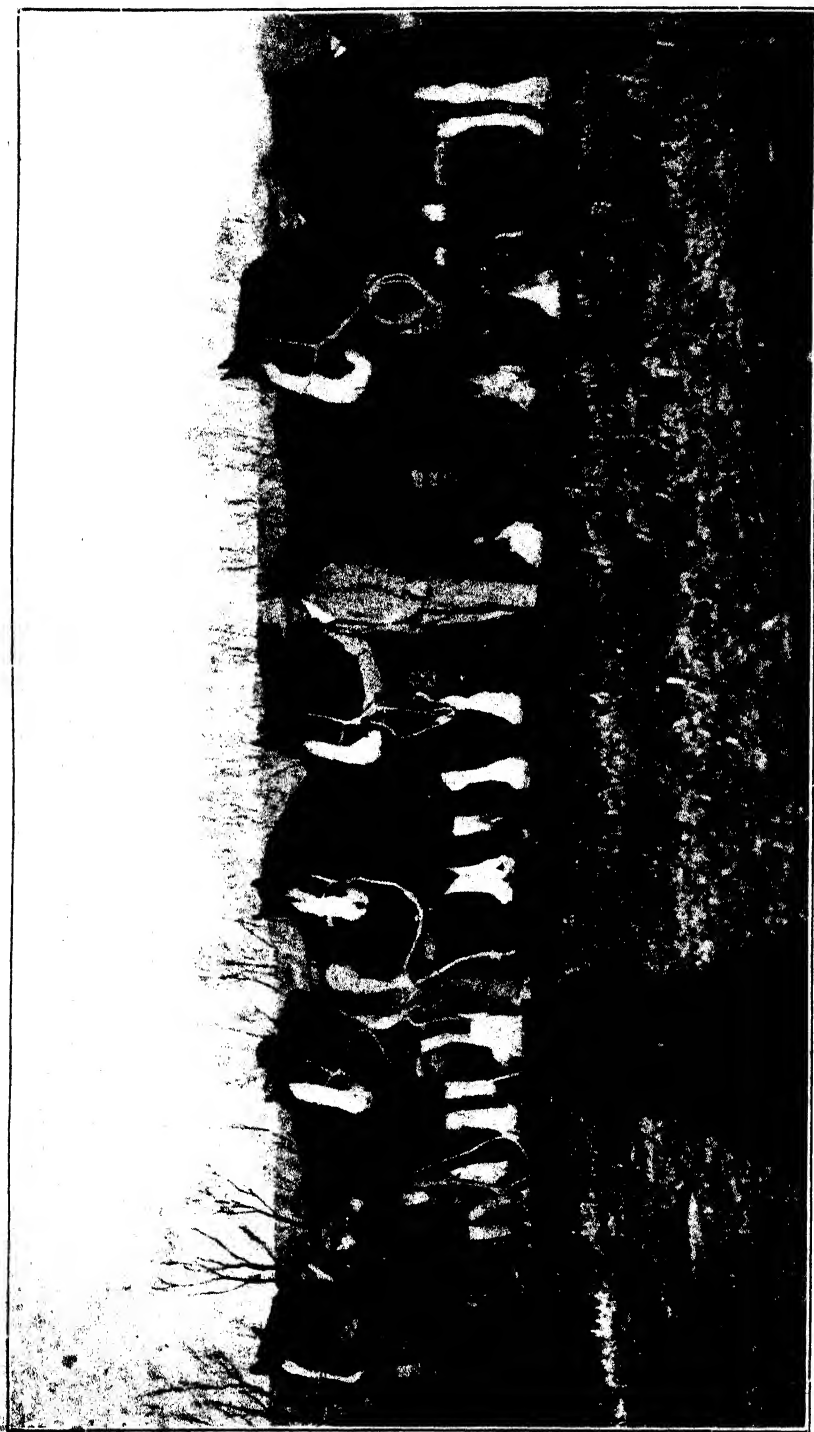


PLATE 25.—ARISTOCRATS OF THE OCHTERTYRE CLYDESDALE STUD, ALLANTON, OTAGO, NEW ZEALAND.

Some of the animals paraded for Mr. Forgan Smith's inspection in the course of his recent New Zealand tour. The four from the right are 3-year-old fillies.



PLATE 26.—“DOMINION DIRECTOR,” ONE OF THE STUD ANIMALS ON THE RUAKURA STATE FARM OF INSTRUCTION, HAMILTON, NEW ZEALAND.

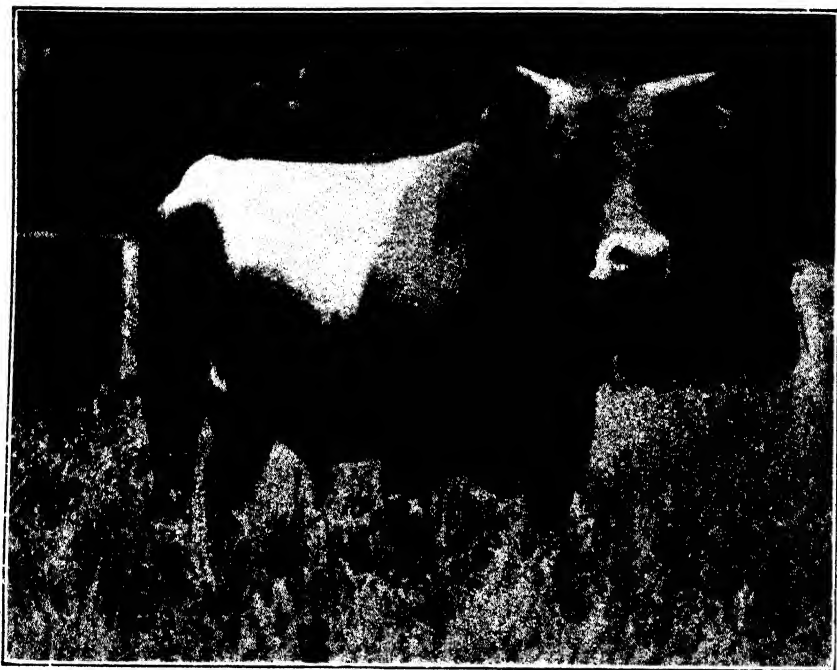


PLATE 27 — "HOLLY OAK BEAUTY KNIGHT" (19 MONTHS OLD).  
Bred at the Ruakura State Farm from the highest producing strain in New Zealand.  
His stance before the camera disguises somewhat his true quality as a stud animal.

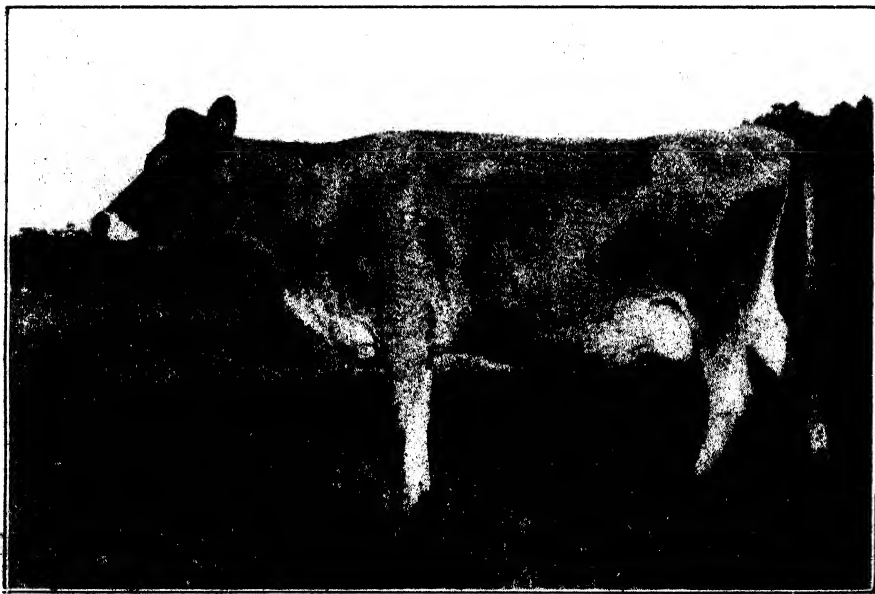


PLATE 28. — "DOMINION GOLDEN FLOSS" — A REPRESENTATIVE JERSEY AT THE RUAKURA  
FARM OF INSTRUCTION, HAMILTON, N.Z.

Holder of the record under semi-official test, season 1926-27: 663 lb. butter fat in 365 days, age 2 years 9 months.



PLATE 29.—“DOMINION ADVANCE,” ONE OF THE JERSEY SIRS AT RUAKUKA STATE FARM, NEW ZEALAND.



PLATE 30.—“DOMINION AVIS.”

Record under semi-official test, season 1926-27: 560 lb. butter fat in 365 days, age 3 years 9 months.



# DAIRYING IN QUEENSLAND.

The Minister for Agriculture and Stock (the Hon. W. Forgan Smith) announced last year the appointment of a Departmental Committee to make a survey of economic facts relating to some important phases of agriculture in Queensland.

The Committee has met from time to time and has collected and collated much useful data. The Minister has previously announced his intention of conveying some conclusions based upon this data to producers through a series of Bulletins.

In the first Bulletin, the text of which appeared in the June "Journal," the present conditions in the industry in Queensland were reviewed briefly, and in this (the second Bulletin) three outstanding factors are elucidated and stressed, namely:—

The need of herd improvement;

The importance of feeding; and

The necessity of herd testing.

This Bulletin not only sets these forth as meriting the immediate attention of those engaged in the industry, but also extends a standing invitation to dairymen to avail themselves of the helping hand of the Department and of the facilities which it offers.—Ed.

## HERD IMPROVEMENT.

### IMPROVED DAIRY SIRES.

An important factor for success in dairy farming is the use of approved dairy sires. Good dairy cows are far too scarce, and it would be impossible for dairy farmers to purchase a sufficient number of them to replace all the unprofitable cows at present in their herds.

#### Selection and Breeding.

The means of eliminating the unprofitable cow is by breeding from selected dams mated with approved sires.

To employ unprofitable cows or rear heifers from them retards the progress of the industry.

The dairy farmer who continues to milk and breed from unprofitable cows will not secure a return commensurate with the capital invested and labour involved.

Every breed of improved live stock has been developed by well-defined laws of selection and breeding.

Under the influence of skilful selection, breeding, and feeding, the dairy cow has developed remarkably, both in type and functions, and differs greatly in general characteristics from the foundation stock from which the modern type has been evolved. For example, the robust constitution and productive characteristics of the Darbalara strain of dairy cattle are outstanding features in the evolution of a modern dairy cow, and are a tribute to the work of the late J. T. Cole, a master mind in dairy stock breeding. The work of other noted stud masters is also evident by the number of high class stock in all our dairy breeds.

**Dairying ranks in importance among farm activities of Queensland next to sugar-growing on the basis of aggregate value.**

It must be remembered that pedigree alone does not guarantee that a sire will beget heavy-producing cows, and show ring points in themselves are not always reliable guides. Consequently, the chief considerations in selecting a sire to head a dairy herd are the milk and fat production records of progenitors on the paternal and maternal sides, and that combine these qualities with type and conformation.

### **THE BETTER BULL SCHEME.**

The Minister for Agriculture, Hon. W. Forgan Smith, recognising the necessity for improving the average production of the cows comprising the dairy herds of this State, has inaugurated the Dairy Cattle Improvement Subsidy Scheme. The conditions under which the subsidy is made available to registered dairy farmers give prominence to the chief factors in increasing the production of the cows comprising the dairy herds, viz., herd testing, culling, and the use of improved dairy sires.

This scheme came into active operation at the end of 1925, and particulars of it are set out in Appendix A attached hereto. It is meeting with an appreciative response from progressive dairy farmers throughout the State.

**Attention to herd improvement will enable the dairyman to meet competition in the world's markets.**

### **Records Favour the Better Bred Dairy Sire.**

The influence of a sire may either increase or decrease the production of his progeny. Herd testing results disclose the prepotency of a sire bred on a production basis.

The work carried out by officers of the Dairy Branch of this Department embraces the testing for butter-fat production of females of the various dairy breeds, in order to qualify for entry in the respective herd books.

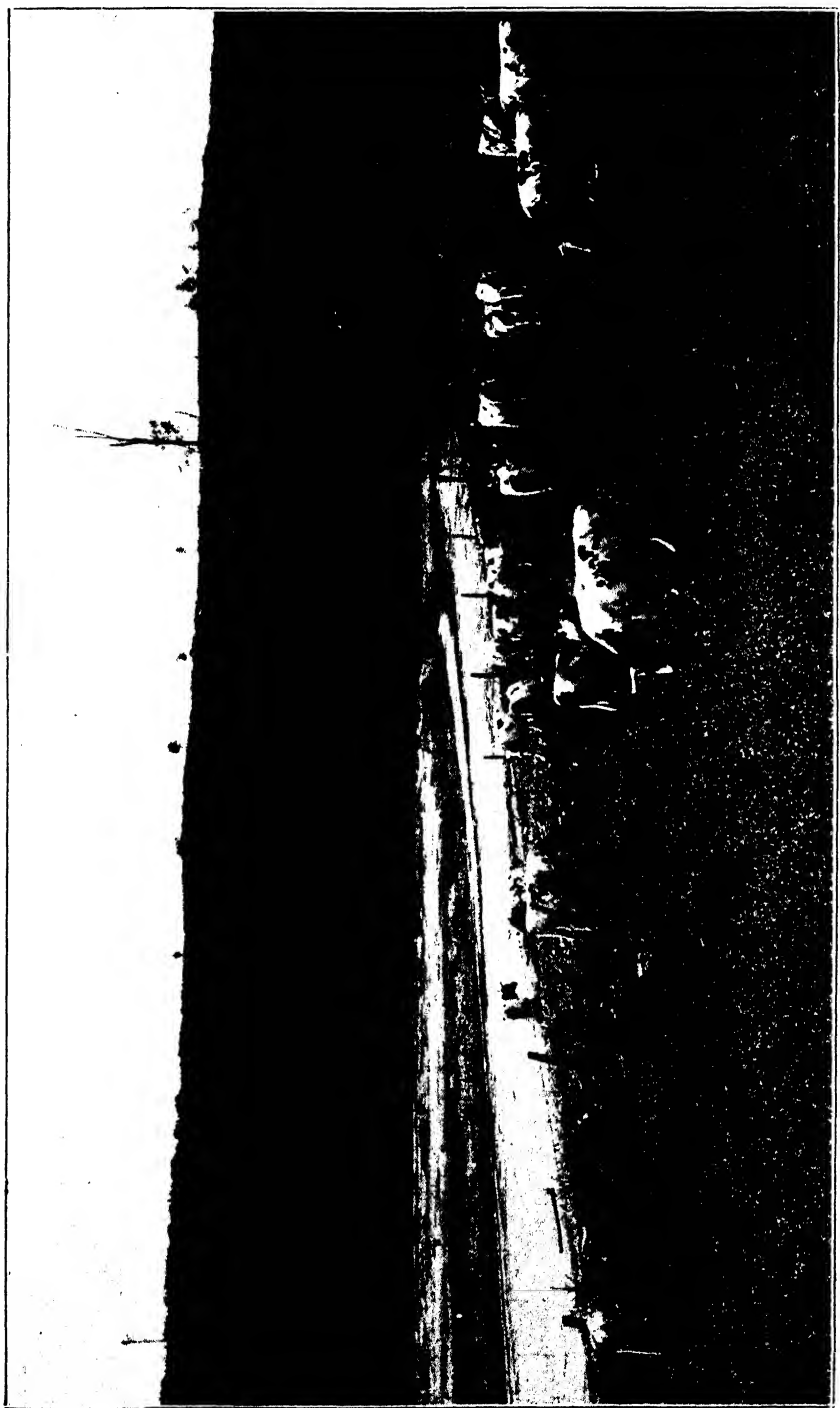


PLATE 32.—ON QUEENSLAND'S DAIRY LANDS—A TYPICAL FARM SCENE.

**The tabulated production records of the progeny of improved dairy sires tells the story in favour of better-bred dairy bulls.**

Following are excerpts from actual Departmental records:—

**Sire A.**

Progeny.	Production.		Period.
	lb. butter-fat.		
No. 1 .. ..	671.64	..	273 days
No. 2 .. ..	623.36	..	"
No. 3 .. ..	499.98	..	"
No. 4 .. ..	498.23	..	"
No. 5 .. ..	488.48	..	"
No. 6 .. ..	463.02	..	"

This sire has ten daughters in the Herd Book Register.

**Sire B.**

Progeny.	Production.		Period.
	lb. butter-fat.		
No. 1 .. ..	529.23	..	273 days
No. 2 .. ..	520.98	..	"
No. 3 .. ..	508.31	..	"
No. 4 .. ..	481.69	..	"
No. 5 .. ..	398.22	..	"
No. 6 .. ..	395.25	..	"

This sire has ten daughters in the Herd Book Register.

**Dairymen are cordially invited to inquire into and avail themselves of the Departmental Scheme for Herd Improvement and Herd Testing.**

**Sire C.**

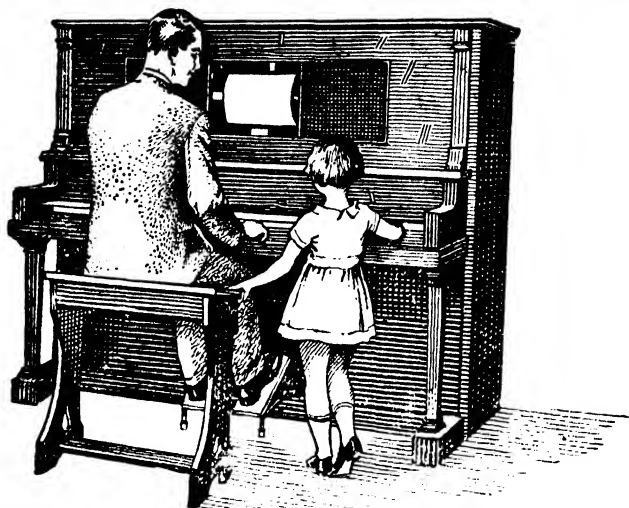
Progeny.	Production.		Period.
	lb. butter-fat.		
No. 1 .. ..	502.35	..	273 days
No. 2 .. ..	439.76	..	"
No. 3 .. ..	435.38	..	"
No. 4 .. ..	419.84	..	"
No. 5 .. ..	416.83	..	"
No. 6 .. ..	415.41	..	"

This sire has sixteen daughters registered in the Herd Books.

It is to be noted that the above groups represent three distinct dairy breeds.

It is obvious that the Better Bull Scheme of the Department of Agriculture and Stock exerts a directly beneficial influence on the industry.

**For high production adequate feeding is essential.**



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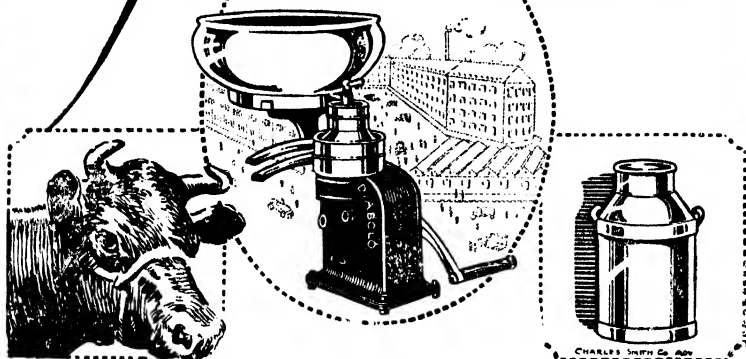
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### **IMPORTANCE OF FEEDING.**

The need for systematic effort to improve the quality and volume of production of the average dairy cow in Queensland is plainly evident and calls for the close attention of all engaged in the industry.

This was borne out by first-hand information collected recently from practical dairymen in the Darling Downs and Lockyer Districts, whose holdings ranged from 150 to 700 acres.

Dairy cows cannot be expected to produce a normal volume of milk unless they are suitably fed.

Any curtailment of the normal lactation, whatever the cause, reduces the return and prevents continuity of supplies so essential to orderly marketing.

### **Introduced Grasses and Fodder Crops.**

The variation in climate and environment under which dairying is carried on calls for a careful study of local conditions to determine the most suitable exotic grasses and fodders to be utilised solely, or as supplementary to indigenous pastures. Scrub lands, almost without exception, should be laid down under Rhodes, paspalum, prairie, Kikuyu, and other suitable grasses. Appendix B contained herein furnishes a generalised list of grasses and crops for coastal, tableland, and inland districts.

There are few directions in which thoughtful planning on the part of the dairy farmer would be rewarded more abundantly than making provision for the proper feeding of his stock. Bulletin No. 3 D will deal fully with this question. There is submitted here, however, information (*see* Appendix B) respecting grasses and fodders suitable for Queensland conditions.

**Dairy farmers have organised manufacturing and marketing.  
Why not organise for better herds?**

### **HERD TESTING.**

#### **The Need for Efficient Management.**

Economic change has brought with it conditions that necessitate the application of more exact business methods in the conduct of dairy farming.

It is essential that the dairy farmer should examine critically his business practices in order that he may eliminate the unprofitable and less profitable sections of his enterprise.

Dairy farming is a complex business, and is subject to influences which do not operate in an ordinary commercial undertaking. The dairy farmer cannot always accomplish what he desires or what he sets out to attain, for weather conditions and other factors affect the results of his enterprise.

**We must increase our butter-fat production on the basis of keeping cows of higher producing capacity.**

It will be found, however, by investigation into management that sectional losses can be reduced and payable activities increased.

Ability to manage contributes largely to success in dairy farming. It is a diversified business and calls for more skill and administrative ability than the farming of one crop.

The successful dairy farmer must have a sound knowledge of agriculture, including the rotation of crops and the conservation of fodder. He must also be well versed in the breeding, feeding, and management of dairy live stock.

**The yield of the individual cows in the dairy herd determines the cost of production, and no single factor has a more important bearing on the financial success of the dairy farmer.**

### **Profit Factors.**

It has been argued that increased production means a market handicap, but economic facts disprove this contention. The profits from dairy farming depend upon two main factors—(a) The volume and cost of production; and (b) the price which the dairy farmer receives for his produce.

### **Elimination of Unprofitable Cows.**

The proportion of unprofitable cows present in many dairy herds is unduly high, and where systematic herd testing is not carried out, many of them remain unidentified or even unsuspected.

Every dairy farmer who hopes and works for better returns must realise the practical benefit of herd testing in the quest for increased production.

Where a large herd of cows is kept, and the income is sufficient to meet general expenses, the dairy farmer does not usually endeavour to find out the cows that are unprofitable. If the individual yields are low, milk production is not profitable. Large numbers of cows of low average yield, instead of increasing profits, actually increase losses.

**Increased efficiency and quality of the product are far more important than an increase in the number of dairy cows in the herd.**

To ensure efficiency it is necessary to ascertain the cows that are paying their way, so that the unprofitable animals may be culled and replaced with profitable ones. By this method average fat-production of dairy herds can be substantially increased without undue cost.

The results of the work of the herd-testing officers of the Department of Agriculture and Stock are of a value that is difficult to estimate. They indicate which of the cows in the herd return sufficient to cover feed and labour costs and provide a reasonable profit.

The unprofitable animal consumes food and gives inadequate return. Culling removes this heavy burden of maintaining non-paying animals.

**Herd-testing is the only sure means of selecting the dam from which heifers are to be bred in order to maintain and improve the herd standard.**

### Lessons from Official Herd Testing Records.

The following impressive figures illustrate the extreme variation between the profitable and the unprofitable herds, judged by the test of monetary return:—

Season 1920-1927.	Com. Butter.	Price per lb.	Value.
<i>Herd Basis—</i>			
	Lb.	s. d.	£ s. d.
A. Production of herd tested for full milking period (30 cows) .. .. .	7,830	1 3	489 7 6
B. Production of herd tested for full milking period (30 cows) .. .. .	3,990	1 3	249 7 6
Difference in favour of herd A .. .. .	3,840	..	£240 0 0
	Com. Butter.	Price per lb.	Value.
<i>Individual Cow Basis—</i>			
	Lb.	s. d.	£ s. d.
A. Average production per cow of highest herd tested for full milking period .. .. .	261	1 3	16 6 3
B. Average production per cow of lowest herd tested for full milking period .. .. .	133	1 3	8 6 3
Difference per cow in favour of herd A .. .. .	128	..	£8 0 0

Even in the best herds unprofitable animals are still to be found. Following are the production figures of the highest producing herd of thirty (30) cows tested by the Department:—

Season 1925-1926.	Com. Butter.	Price per lb.	Value.
<i>Herd Basis—</i>			
	Lb.	s. d.	£ s. d.
A. Production of herd for full milking period, (30 cows) .. .. .	7,170	1 3	448 2 6
B. Average yield of cows in same herd for full milking period .. .. .	239	1 3	14 18 9
<i>Individual Cow Basis—</i>			
C. Highest individual yield for full milking period .. .. .	431	1 3	26 18 0
D. Lowest individual yield for full milking period .. .. .	156	1 3	9 16 0
Difference between C and D .. .. .	275	..	17 3 9

Other Departmental records show that a number of herds have an average production equivalent to 260 lb. of commercial butter in 273 days, while individual animals in herds have greatly exceeded this quantity.

The Australian record is 1,888 lb. of commercial butter in 365 days, which is also a world's record.

The Pure Bred Herd Book Societies require that in the case of a mature female the production must be 340 lb. of butter-fat in 273 days, the equivalent of 400 lb. of commercial butter.

#### **A REASONABLE OBJECTIVE.**

**An average yield of 260 lb. of commercial butter per cow per year is not beyond early achievement. The Department of Agriculture and Stock asks for the co-operation of all engaged in the industry to reach this objective.**

**Its attainment means a greater measure of prosperity to all concerned.**

The figure (260 lb.) is the average annual production between the present average yield (120 lb. commercial butter) and the standard (400 lb. commercial butter) set down by the Pure Breeders' Association.

#### **Queensland's Average Production Must be Increased.**

The average yield per cow in Queensland is below that of some competing dairying countries, and it is essential that the present average production of butter-fat be materially increased to permit of a profitable return to all engaged in the industry.

There does not appear to be any insurmountable reason why this result should not be achieved by (1) breeding from the best producing stock; (2) better feeding; (3) systematic herd testing.

**The Department of Agriculture and Stock invites the cordial co-operation of dairymen and their organisations in attaining the abovementioned reasonable objective which would mean—**

**More money to the farmer.**

**Better conditions in the Industry.**

**Benefit to Queensland.**

Individual butter-fat records have shown many dairymen how to increase the production of their herds, and have assisted others who were really in earnest, to add substantially to their income.

The herd-testing scheme of the Department of Agriculture and Stock provides for the testing of dairy herds free of charge.

**Have you availed yourself of this service?**

## Summary of Work Accomplished.

Herd testing commenced in Queensland in the year 1910, and the Department is desirous of interesting an increasing number of dairymen in the potentialities of this practice. The following figures summarise the work accomplished:—

Number of cows tested 1910 to 30th June, 1921 .. ..	50,000
Number of cows tested for year ending June, 1922 .. ..	4,000
Number of cows tested for year ending June, 1923 .. ..	4,500
Number of cows tested for year ending June, 1924 .. ..	6,000
Number of cows tested for year ending June, 1925 .. ..	8,500
Number of cows tested for year ending June, 1926 .. ..	15,701
Number of cows tested for year ending June, 1927* .. ..	5,016
	<hr/> 93,717 <hr/>

\* An abnormally dry year.

From the subjoined table it will be seen that there was a considerable variation in production in the several dairying districts of the State. The figures indicate that the system of animal husbandry practised on the Darling Downs is apparently superior to systems in vogue in other dairying regions where seasonable conditions, particularly in winter, are less harsh. They would also suggest that Downs dairymen possess a better class of stock. It is a common experience in every country that where the conditions of rural industry are harder, efficiency is greater. Climatic conditions are probably easier in other districts of Queensland than on the Darling Downs. Yet the Downs' production records show up more than favourably by comparison. There is an impressive moral in this that a study of the table below makes quite obvious.

The district figures are—

	No. of Herds from which averages have been computed	1924-1925.				No. of Herds from which averages have been computed.	1925-1926.			
		Average daily production of milk.	Average fat.	Average daily production of butter fat.			Average daily production of milk.	Average fat.	Average daily production of butter fat.	
		lbs.	Per cent.				lbs.	Per cent.		
Darling Downs ..	219	19.72	4.0	.79	130	18.5	3.86		.71	
South Burnett ..	109	18.54	4.06	.75	109	14.9	4.3		.64	
West Moreton ..	72	17.46	4.12	.72	98	15.7	4.4		.69	
Central Burnett ..	59	15.86	3.93	.62	20	14.8	3.95		.58	
North Coast ..	138	15.25	4.1	.62	140	15.3	3.9		.59	

## A Concluding Argument.

Actual figures speak eloquently. Take, for example, a herd of thirty (30) cows, the average production of which is equal to the present Queensland annual average of 120 lb. commercial butter. At 1s. 3d. per lb. commercial butter its production would be worth £225. A herd of the same number averaging in annual production 260 lb. commercial butter—the quantity set out in this Bulletin as a reasonable objective for the Queensland dairyman—would return, with the product at the same price, £487 10s., **representing an increased return of £262 10s.**

**APPENDIX A.****DAIRY CATTLE IMPROVEMENT SUBSIDY SCHEME.**

Subject to the conditions hereafter mentioned the Minister for Agriculture will make available to the approved purchaser of any such bull as complies with the prescribed conditions a subsidy of 50 per cent. of the purchase price, provided such subsidy shall not exceed £50. The subsidy will be available to the approved purchaser of an eligible bull at public auction, and the subsidy shall also apply in the case of private sale, provided, however, that the approval of the Minister is first obtained, and that both the vendor and purchaser make the necessary statutory declarations to meet the requirements of the Minister.

The subsidy is available in such areas of the State as are proclaimed under "*The Dairy Produce Act of 1920.*"

**Conditions.**

1. The bull must have passed the tuberculin test by a veterinary officer within three months prior to date of sale.

2. The bull must be in good health, well grown, and true to type.

3. The bull shall be registered in a recognised Herd Book or be eligible for registration.

4. The bull shall be not less than twelve months and not more than six years old, provided the Minister may approve of the purchase of an older bull which has sired high-producing females on official test.

5. The vendor of any bull three years old and over must produce evidence of fertility in the preceding year.

6. The vendor of any bull shall produce concerning such bull a declaration of health on a form to be supplied by the Department of Agriculture and Stock.

7. The bull shall be the progeny of an approved sire and an officially tested dam which has reached the undermentioned butter-fat standards during 273 days' milking:—

2 years or under	..	..	..	230.5 lb. butter-fat
3 years or under	..	..	..	267 lb. butter-fat
4 years or under	..	..	..	303.5 lb. butter-fat.
5 years or over	..	..	..	340 lb. butter-fat.

Add 1/10 lb. butter-fat for each day over the year indicated up to five years.

If a cow or heifer at a first test fails to reach the standard but subsequently attains it as set for her, her progeny may upon decision of the Minister thereby be rendered eligible.

8. The purchaser's application for subsidy shall be made on a form supplied by the Department of Agriculture and Stock. Any bull in respect of which the purchaser has received a subsidy as aforesaid shall, if required, be made available for the use of other dairymen, at a fee not exceeding 10s. per cow. In the case of bulls under two years of age at date of purchase the owner need not accept more than ten outside cows during the first year nor more than fifteen outside cows for bulls two years or over. In all cases of applications for service of outside cows preference is to be given to cows which have been subjected to a butter-fat test.

9. The purchaser of a bull shall have the right to refuse the service of such bull for any cows which he may have reason to believe to be suffering from disease, provided that the owner of such cows is unable to produce a certificate of a qualified veterinary surgeon to the effect that such cows are free from diseases.

10. The purchaser shall submit to the Department of Agriculture and Stock at the expiration of twelve months after purchase and at intervals of twelve months thereafter (a) a declaration of health of the bull on a form procurable at the Department of Agriculture and Stock and (b) signed statements from the owners of all outside cows served and dates of service in accordance with conditions outlined above. (c) The purchaser shall immediately report to the Department of Agriculture and Stock if the bull is in ill-health from any cause whatever or if such bull goes out of his possession or supervision.

11. The bull shall be kept under conditions satisfactory to the Department of Agriculture and Stock.

12. In the allocation of subsidy by the Minister preference will be given to prospective buyers of eligible bulls who have submitted their herds to a butter-fat test under the herd-testing scheme of the Department of Agriculture and Stock.

13. It shall not be permissible for the owner of a bull who has received a subsidy to resell the animal without the sanction of the Minister.

14. Any purchaser of a bull who receives a subsidy and who commits a breach of any of these provisions shall be liable to forfeit an amount not exceeding £10.

## APPENDIX B.

## DAIRY FODDER CROPS RECOMMENDED FOR USE IN QUEENSLAND.

Crop.	Purpose for which Sown.	WHEN TO SOW OR PLANT.				Distance of Rows between Plants.		Quantity Seed per Acre if Drilled.	Quantity Seed per Acre if Broadcast.	Approximate Period of Growth.	Remarks.
		Coastal Districts.	Tableland Districts.	Inland Districts.		Ft. In.	Ft. In.				
Barley, Cape ..	Green feed	Mar. to June	Mar. to July	Mar. to June	..	..	..	1 bus.	1½ bus.	2 to 4	Useful as a green fodder in its early stages alone or in conjunction with early maturing legumes. Forms a useful fodder crop, also a fine quality hay, and may be employed in conjunction with early and late maturing legumes. Makes a fine stalked hay and is valuable as a grazing off crop. Should be grown in pastures where possible. Suitable only in certain temperate tableland districts within coastal areas. A good standby; the ninety stalked variety recommended in preference to the Cuban and so-called Indian varieties. Somewhat difficult to conserve as hay; is valuable asilage crop in conjunction with sorghums and fed to cows, cut when pods have formed, after wilting for twenty-four hours. Matured growths are unsuitable to stock, abundant forage is provided by young growths. Recommended for use in conjunction with winter cereals. Suitable for semi-tropical and tropical conditions.
Barley, Skinless	Hay ..	Mar. to June	Mar. to July	Mar. to June	..	..	..	1 bus.	1½ bus.	2 to 4½	
Canary Seed ..	Hay and grain ..	..	May to June	May to June	..	..	..	15 lb.	..	4½ to 5	
Clovers ..	..	..	..	..	..	..	..	..	..	..	
Cocksfoot ..	Pasture ..	..	Apr. to May	..	..	..	..	..	1½ bus.	..	
Cow Cane ..	Cattle food	Sep. to Dec.	..	..	5 0	1 6	5,800 sets..	..	..	7 to 8	Suitable for semi-tropical and tropical conditions. Will not stand frost; owing to its lack of seed production it must be propagated by roots. One of the best forms of fodder; is rich in protein and particularly useful as a hay, and practically forms a balanced ration in itself. A popular fodder useful as a forage crop and one of the best for grain purposes and suitable for grazing off, also for silage. A quick growing fodder and hay crop; suitable for "grazing off" crop and more suited for this purpose than for hay.
Cowpea ..	Grain or hay	Sep. to Jan.	Oct. to Jan.	Oct. to Jan.	3 0	0 8	10 lb.	..	15 to 20 ..	4 to 4½	
Elephant Grass	..	Aug. to Oct.	..	..	..	..	..	..	..	4 to 5	
Field Peas ..	Fodder ..	Mar. to June	Mar. to June	Apr. to June	2 0	..	½ to 1	..	1 to 1½	4 to 5	Will not stand frost; owing to its lack of seed production it must be propagated by roots. One of the best forms of fodder; is rich in protein and particularly useful as a hay, and practically forms a balanced ration in itself. A popular fodder useful as a forage crop and one of the best for grain purposes and suitable for grazing off, also for silage. A quick growing fodder and hay crop; suitable for "grazing off" crop and more suited for this purpose than for hay.
Giant and other Cowh Grasses.	Pasture ..	Aug. to Oct.	Aug. to Oct.	..	..	..	..	..	..	..	
Kikuyu ..	Pasture ..	Sep. to Jan.	Sep. to Jan.	Sep. to Jan.	4 0	4 0	2,722 roots per acre	..	..	..	
Lucerne ..	Hay and green feed	Apr. to May	Apr. to May	..	Drilled	..	12 to 14 lb.	..	16 to 20 lb.	1½ to 2	Will not stand frost; owing to its lack of seed production it must be propagated by roots. One of the best forms of fodder; is rich in protein and particularly useful as a hay, and practically forms a balanced ration in itself. A popular fodder useful as a forage crop and one of the best for grain purposes and suitable for grazing off, also for silage. A quick growing fodder and hay crop; suitable for "grazing off" crop and more suited for this purpose than for hay.
Maize ..	Fodder and grain	Aug. to Jan.	Sep. to Jan.	Sep. to Jan.	4 0	1 3	8 to 10 lb.	..	..	4 to 5	
Milets, Foxtails	Hay and fodder	Sep. to Jan.	Oct. to Jan.	Sep. to Jan.	Drilled	..	10 to 14 lb.	..	14 to 16 lb.	2	
Milets, French	Fodder and grain	Sep. to Jan.	Sep. to Jan.	Sep. to Jan.	..	..	7 to 8 lb. ..	..	10 to 12 lb.	1½ to 2	

**APPENDIX B—continued.**  
DAIRY FODDER CROPS RECOMMENDED FOR USE IN QUEENSLAND.—continued.

Crop.	WHEN TO SOW OR PLANT.				Distance of Rows between Apart.		Quantity of Seed per Acre if Broadcast.		Approximate Period of Growth.	Remarks.
	Purpose for which Sown.	Coastal Districts.	Tableland Districts.	Inland Districts.						
					Ft.	In.	Ft.	In.	Months.	
Oats	Hay and green fodder	Apr. to June	Apr. to June	April to June	..	..	1½ bus.	..	1½ to 2 bus.	3 to 5 In conjunction with field peas or fava forms one of the most useful winter fodders; suitable for sowing or grazing off, and one of the best winter cereals for hay purposes. Suitable for hay or grazing off purposes.
Panicum	Hay and green fodder	Aug. to Feb.	Sep. to Feb.	Sep. to Feb.	..	..	10 to 14 lb.	..	2	2 Where regular rainfall is assured and the grass not allowed to run to seed, forms a useful grass and is recommended for coastal dairying areas.
Paspalum	Pasture	Sep. to Jan.	Sep. to Jan.	..	..	..	..	..	3 to 4	A valuable winter grass, highly nutritious and makes a fine class of hay, but requires autumn and winter rains for its development.
Prairie	Pasture and hay	Apr. to May	Apr. to May	Apr. to May	..	..	..	..	3 to 4	A valuable fodder crop for dairy cattle and can be stored for a reasonable period.
Pumpkin	Fodder	Aug. to Jan.	Sep. to Jan.	Sep. to Jan.	8 to 10	3 to 4	2 lb.	..	5 to 6	A rapid grower and once established useful as a dairying grass for scrub and other lands in semi-tropical belt; a good hay
Rhodes	Pasture and hay	Sep. to Jan.	Sep. to Jan.	Sep. to Jan.	..	..	..	..	2 to 3	than maize in dry districts.
Rye	Fodder	Mar. to June	Apr. to June	Apr. to June	Drilled	..	3 to 1 bus.	..	3 to 5	For silage purposes or green fodder; may also be conserved in the form of stover
Sorghum, Grain	Fodder and grain	Aug. to Feb.	Sep. to Jan.	Sep. to Jan.	3 to 6	0 to 8	3 to 4	..	3½ to 5	Capable of making a good class of hay, or in conjunction with sorghum forms a useful silage crop.
Sorghum, S. ech.	Fodder	Aug. to Feb.	Sep. to Feb.	Sep. to Jan.	3 to 6	0 to 8	4 to 5 lb.	..	3½ to 5	A useful form of sorghum largely used in the Darling Downs for grazing off.
Soy Beans	Grain and fodder	Sep. to Jan.	Oct. to Jan.	..	2 to 6	0 to 8	5 to 10	..	3	A late maturing legume and when combined with wheat constitutes practically a balanced ration.
Sudan Grass	Hay and fodder	Sep. to Feb.	Sep. to Jan.	Sep. to Dec.	2 to 6	..	3 to 4	..	2	A good winter fodder alone or in conjunction with field peas and vetches; makes excellent hay.
Tares (Vetches)	Fodder	Mar. to June	Mar. to June	Apr. to June	3 to 0	..	1 to 3	..	4 to 6	
Wheat	Grain and hay fodder	Apr. to May	Apr. to July	Apr. to June	Drilled	..	3	..	3 to 5	

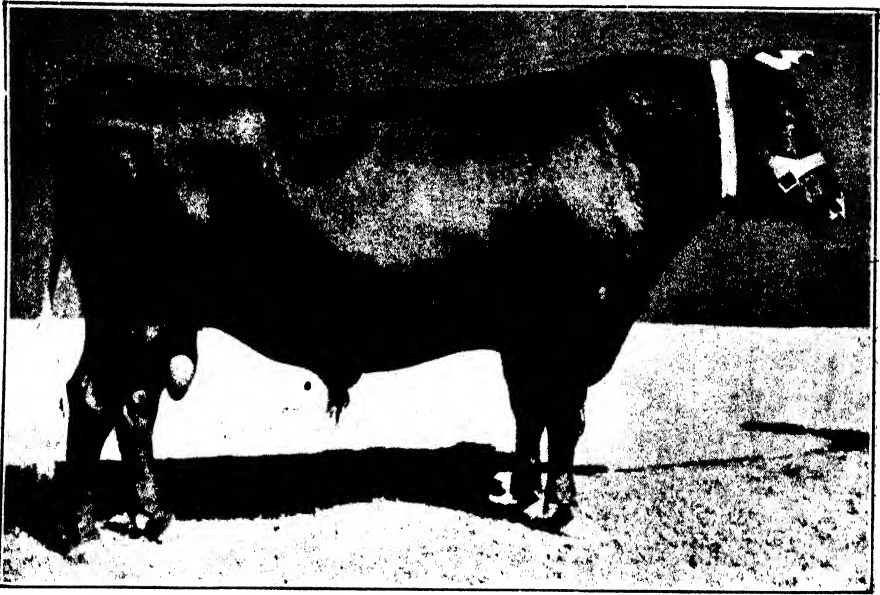


PLATE 33.

Illawarra Milking Shorthorn Bull, a consistent prize winner at the Royal National and other Queensland shows. One of the finest specimens of the breed we have at present in the State. The chief considerations in selecting a sire to head a dairy herd are type, conformation, and milk and fat production records of progenitors.

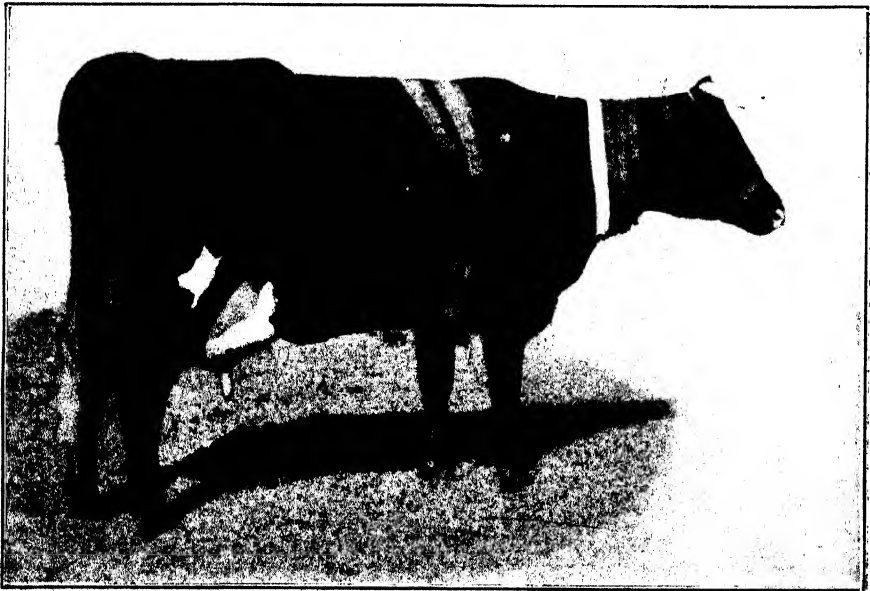


PLATE 34.

Illawarra Milking Shorthorn Cow representative of the breed in this State. A Reserve Champion and consistent prize winner for her owner, a Queensland breeder.

## APPENDIX C.

## DAIRY STATISTICS.

Years 1922, 1923, 1924, and 1925.

		1922.		1923.	
		Commonwealth.	Queensland.	Commonwealth.	Queensland.
Number of dairy cows	..	2,381,480	558,945	2,362,227	538,106
Milk production	.. gall.	685,310,000	134,032,000	672,532,000	104,204,000
Average production	.. gall.	288	240	285	194
Milk used—Butter-making	.. .. gall.	524,759,122	110,626,662	504,582,351	83,903,988
Milk used—Cheese-making	.. .. gall.	23,087,651	9,774,783	25,389,566	7,244,735
Milk used—Condensing concentrating	.. .. gall.	14,301,099	2,700,788	16,888,972	2,181,379
Milk used—Other purposes	.. .. gall.	123,161,710	10,929,597	125,670,634	10,873,775

		1924.		1925.	
		Commonwealth.	Queensland.	Commonwealth.	Queensland.
Number of dairy cows	..	2,374,641	548,707	Unavailable	611,426
Milk production	.. gall.	862,394,000	170,074,000	..	165,656,388
Average production	.. gall.	363	310	..	271
Milk used—Butter-making	.. .. gall.	677,316,371	143,088,224	..	137,673,615
Milk used—Cheese-making	.. .. gall.	32,328,872	12,462,873	..	13,499,044
Milk used—Condensing concentrating	.. .. gall.	17,629,426	2,657,981	..	2,437,100
Milk used—Other purposes	.. .. gall.	135,119,046	11,864,622	..	12,046,629

AVERAGE MILK PER COW IN VARIOUS STATES FOR THE YEARS 1921, 1922, 1923,  
AND 1924 AT 4 PER CENT. FAT.

	1921.		1922.		1923.		1924.	
	Gals.	Butter Fat.	Gals.	Butter Fat.	Gals.	Butter Fat.	Gals.	Butter Fat.
New South Wales	363	145.2	281	112.4	285	114	391	156.4
Victoria	366	146.4	329	131.6	340	136	393	157.2
Queensland	301	120.4	240	96	194	77.6	310	124.0
South Australia	333	133.2	316	126.4	350	140.	336	134.4
Western Australia	223	89.2	213	85.2	217	86.8	218	87.2

## APPENDIX D.

## THE DEPARTMENTAL HERD-TESTING SCHEME.

Customarily it is expected that approximately 200 dairy cows will be submitted simultaneously to the test in a locality visited by the herd-testing officer.

No fee is charged to cover the cost of testing, but it is expected



PLATE 35.

A typical Friesian Cow in a well-known Queensland herd—a Champion prize winner in the show ring.

that those submitting their herds to a test will arrange for the conveyance of the testing appliances from the nearest railway station to the centre where it is intended the testing shall be carried out; and in instances where there is available no hotel or boarding-house accommodation for the herd-testing officer, it is expected that those submitting their herds to a test will arrange board and lodging (not free) for that officer during such time as he is actually engaged in the testing of the herds. Following are detailed particulars of the Departmental scheme:—

The object of dairy herd testing is to raise the standard of the milch cows in the dairying districts of Queensland, and to give the dairymen such instruction in milk-testing as shall enable them to test and record the milk yields of their cows and to estimate the amount of butter-fat produced by each dairy cow.

The supervision of the scheme and the testing of the herds are controlled by the Department of Agriculture and Stock, and the actual testing of the milk yields of the cows submitted to the test is carried out by an officer of that Department. The method adopted is to carry out four periodical tests at intervals of approximately sixty days throughout the season.

A record of butter-fat produced by each animal tested is computed from these test results, and a copy is forwarded to the owner at the end of the lactation.

No fee is charged for such services, but in order to ensure continuity of the tests dairy farmers are asked to sign an agreement form, that they are willing to submit their herds for testing at least four times during a season.

Application for the services of a herd-testing officer should be made through the Local Producers' Association to the Under Secretary, Department of Agriculture and Stock, Brisbane.

It is essential that dairy farmers in each locality should submit their herds simultaneously, and that whenever possible at least two hundred cows be brought forward for testing in each centre.

It is the wish of the Department that the full benefits of the officers' services may be available to both the dairymen and the State, and that all milch cows proven unremunerative as butter-fat producers will be withdrawn from the herds and replaced by more suitable and profitable animals.

It is not expected that any faulty or unprofitable cows, discovered through the efforts of our officers, will be disposed of by an unscrupulous dairyman to his neighbour.

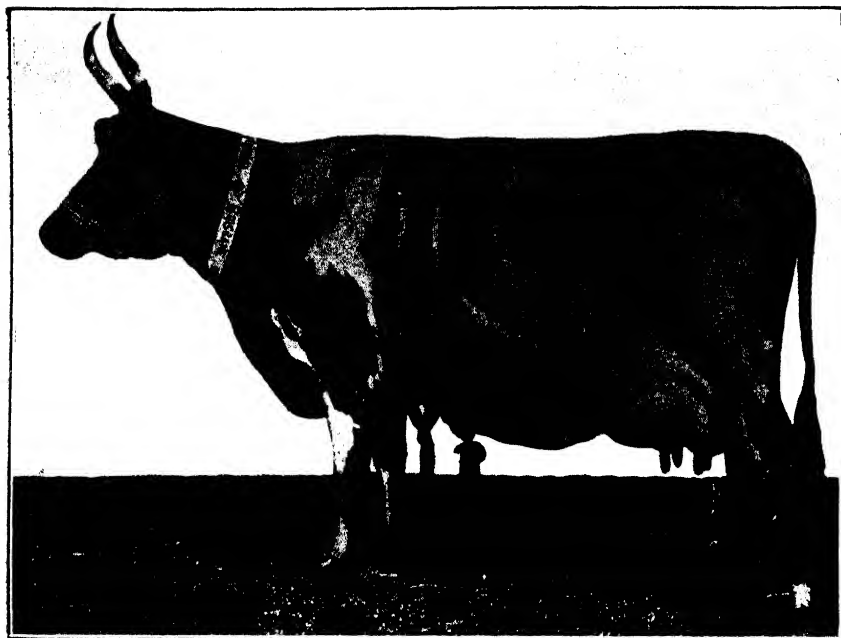


PLATE 36.

An Ayrshire Cow in a noted Queensland herd, representing the type that fills the eye of the breeder who combines bucket value with show ring fancy.



PLATE 37.

A Champion Jersey Cow, in her day a great prize winner in every Jersey class. Representative of type of milk producer aimed at by Queensland breeders.

### **Directions for taking Samples for Testing.**

In taking the sample of milk the greatest care must be exercised to procure a representative sample, as upon this practically depends the value of the testing.

As soon as the milk is drawn from the cow it should be weighed. A small spring balance is the most suitable for this. Immediately after weighing, pour the milk from one bucket to another several times, and without delay take a small quantity of the milk with the ladle supplied and pour the milk into the sample bottle. The larger-sized ladle is to be used for taking the morning sample, and the smaller-sized ladle for measuring the evening sample.

The bottles supplied contain a preservative, and they must be kept securely corked after each sample is taken. Do not wash out the bottle before putting the milk in.

On the chart supplied write the name of each cow plainly in the column set out for that purpose; also, the corresponding number appearing on the chart must be written on the frosted surface of sample bottle. Then, as the cows are milked, record the weight of the milk yield opposite the name of each animal on the chart, and take the sample as above directed.

When the samples of milk have been taken for a period of four days with hand-milked herds and forty-eight hours where milking machines are used, they should be forwarded to the officer in charge of the testing in your district, who will give any further information you may require.

In no case will testing be done of samples taken for one day only.

Dairymen are advised that the test results are not sufficiently reliable for the purpose of culling a herd unless composite samples are taken and tested at intervals of about two months during lactation period. The requisite sample bottles will be periodically supplied by this office.

In order that correct records may be computed it is important that owners supply the date of calving of cows submitted.

As far as possible, the testing officer will instruct dairy farmers at each centre in the practice of testing milk by the Babcock method.

In every instance the full complement of cows in profit in the herds must be entered for testing by dairymen.

It is not intended that the testing officer will provide test results relative only to a few selected animals from each herd.

Where no hotels are available, it is expected that arrangements will be made for accommodation of the testing officer.

The Department pays the freight on the railway, but where it is necessary to carry the plant by other conveyance it is expected that farmers will defray the expenses.

**Other Bulletins will be issued at intervals.**

**PHOSPHORUS DEFICIENCY IN STOCK.**

Lecture by SIR ARNOLD THEILER, K.C.M.G., D.Sc., Dr. Med. Vet.

*Phosphorus deficiency is unquestionably a limiting factor in the growth rate of cattle, and a dominating factor in the maintenance of live-weight under ordinary grazing conditions. The foregoing points formed the text of a most important public lecture delivered by Sir Arnold Theiler, a world-renowned veterinary scientist, and a visitor to Australia under Commonwealth auspices, at the Queensland University, on 16th July. The lecture created a profound impression, and although the feeding of bone-meal to stock has been practised by some farmers in the coastal belt in Queensland for upwards of twenty years, the information given by the eminent lecturer is greatly appreciated. The subjoined report will be read with interest by Queensland stock raisers.*

IN this Journal for March, 1925, we reprinted a very able article—"Phosphorus in the Live Stock Industry"—from the "Journal of the Department of Agriculture," of the Union of South Africa,\* by Sir Arnold Theiler, Dr. H. H. Green, and Dr. P. J. du Toit. That article created a widespread interest among stock owners in Queensland, who also recognise the valuable work done here by Mr. J. C. Brünlich, of the Department of Agriculture and Stock, on somewhat similar lines.

It was as the outcome of the Imperial Conference of the Council of Scientific and Industrial Research, held last year, that Sir Arnold Theiler was invited to visit Australia to exchange ideas and to discuss matters of mutual interest with the men engaged in veterinary research in this country. He is recognised as a world's authority on matters concerning the health of stock, and though born in Switzerland, has spent most of his life in South Africa. He retired last year from the position of Director of the Veterinary Institute of South Africa, at Pretoria, a post he had held since 1906. This institute is the largest of its kind in the world, and is devoted to the training of men in scientific veterinary research.

The lecture was given under the aegis of the Royal Society, and the Vice-President (Professor E. J. Goddard) presided.

Sir Arnold, in his opening remarks, said that he had come to Australia with an open mind to interest himself in Australia's problems in so far as animal health conditions were concerned. Such problems in South Africa appeared to have much in common with those in Australia, although Australia did not possess certain pests found only in an older country.

**A Mysterious Malady.**

Delving straight away into his subject, Sir Arnold said that for many years a disease had existed in South Africa, causing paralysis and death of cattle, and its cause was a mystery. Many stock owners in Australia would remember that the same disease was very much in evidence in this country some twenty-six years ago. Fortunately the occurrence of this disease was now comparatively rare, as most stock owners now used licks containing bone-meal, or other mineral foods containing phosphates for their stock.

Sir Arnold then proceeded to outline the thorough investigations which were made to determine the nature of the disease, which, for want of a better name, was variously described as "land sickness," because it was generally believed that the land had become unhealthy through continuous grazing, or paralysis, on account of paralysis of the body—particularly the hind portions—which, in the later stage of the disease, prevented the animal from getting on to its feet. The first investigation made was to determine whether ticks or toxic plants were responsible for the disease, and at the same time a careful study was made of the animals in the field. It was noticed that thriftless animals indulged in the habit of chewing sticks and bones. This provided the clue. An examination was made of fragments of bone picked up on the veldt. Some of these bones were desiccated, and cultures were prepared, from which toxic bacteria were isolated. When a drench containing a quantity of these crushed bones was administered to cattle, the paralysis disease was produced. The cultures prepared from the bacteria found in the bones was so toxic that an injection of one

\* "Jour. Dept. Agr." South Af., No. 5, Vol. VIII., 1924.

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ten-thousandth part of a cubic centimetre would produce illness, followed by paralysis. This culture was found to be toxic for all domestic animals. The credit for isolating this bacterium belonged to Dr. Seddon, of New South Wales, and subsequently a bacterium was isolated in South Africa, which Sir Arnold regarded as identical with that discovered by Dr. Seddon.

### **The Bone-chewing Habit.**

But the unnatural habit displayed by cattle, which caused them to chew bones, and even to eat the flesh of other animals, suggested to Sir Arnold a craving for some mineral substance which was deficient in the food. It was found that the diseased animal was affected by weakness of the skeleton, and experiments were instituted to determine whether this osteophagia—or bone-eating craze—was due to a deficiency of calcium or phosphorus. Phosphorus was supplied in various forms—organically by means of wheat-bran, and directly, in the form of sterilised bone-meal, sodium phosphate, and phosphoric acid. In each case in which phosphorus was supplied the disease was checked, but recurred when the phosphorus was discontinued. The control animals, on the other hand, which were fed with chalk, showed no improvement, but, on the contrary, osteophagia became more acute. It was also found that the disease disappeared when animals were grazed upon pastures dressed with phosphatic fertilisers.

### **Experiments in the Field.**

Continuing, Sir Arnold said that in order to determine the composition of the natural food, analyses were made of the pastures each month throughout the year. These disclosed the fact that the young grass contained a higher percentage of phosphates, and the phosphate content reached its peak in the spring, with a percentage of .6, but receded to .69 per cent. at the end of summer. Similarly, osteophagia was checked when the animals were grazing upon young grass, but was found in its most acute forms when the phosphate content of the grass was low. The estimated energy value of the grass was highest when it was young, and the lime content increased during the year as the estimated energy value decreased. In this way it was deduced that the craving for minerals was produced by synthetic feeding upon a ration consisting of chaff, and the endosperm of maize, which is deficient in phosphates. In every case the disease was checked when 3 oz. of bone-meal was added to the daily ration. Diseased cattle were then lined up in a crush and given daily doses of 3 oz. of bone-meal. They quickly learned that the drench—it was given in that form—was beneficial, and patiently but expectantly awaited their turn for treatment. The sleek, healthy appearance of these cattle contrasted strongly with the miserable and emaciated condition of the controls which received no bone-meal.

### **Remarkable Demonstrations.**

Sir Arnold proceeded to describe the wonderful results achieved. Fifty head of cattle, all about the same age and weight, were selected for an experiment, which commenced in June, and lasted for twelve months. Those which received a daily allowance of 3 oz. of bone-meal steadily increased in weight, being 67 lb. heavier than the controls (average) in February, and 105 lb. heavier in May. The controls put on weight in the spring, while the phosphatic content of the pasture was at its peak, but developed osteophagia as the summer advanced. At the end of the year they were about the same weight as at the beginning of the experiment, whilst the others retained practically the whole of the weight gained. The experiment was repeated with younger animals, which averaged about 650 lb. At the end of the year the animals receiving a daily allowance of bone-meal reached an average weight of 900 lb., while that of the controls was 750 lb. Although due allowance must be made for the larger frames of the heavier animals, the greater proportion of the increased weight consisted of meat. Experiments conducted to determine the mineral requirement of different animals indicated that mature animals require less than growing youngsters; cows in calf require up to 24 oz. of bone-meal per week; but a cow which loses her calf requires less. Analysis of milk shows that there is no increase in the phosphoric acid content of the milk, but there is an increase in quantity of milk up to 40 per cent. Where the food is deficient in phosphate, the quality of the milk is maintained by leaching out phosphates from the skeleton, the animal suffering, of course, as a consequence of this drain upon the skeletal structure.

### **How Bone-meal Affects Growth.**

Another experiment which provided valuable information was designed to test the influence of phosphorus on growth. The animals selected were fed a ration of flaked maize, which has a low phosphorus content, with an ad libitum supply of hay of low phosphorus content. Half the animals were given a daily ration of bone-

meal from July to October, when the experiment was reversed, and again reversed in February. The crossing of the lines of the graph when the conditions were reversed indicated a rapid response to the added phosphate. While receiving phosphates, the animals consumed a larger quantity of hay, but turned it to good account, for they made rapid gains in weight. It would appear, therefore, that phosphorus played an important part in metabolism, acting in this regard similarly to a vitamin.

### Rickets in Stock.

The lecturer then passed on to a consideration of rickets, which is prevalent among stock in South Africa, where both calcium and phosphorus are deficient. Rickets is indicated by the animals becoming lame, exhibiting an excessive growth of hoof, and a thickening of the joints. The addition of lime alone failed to cure this condition. The disease could be artificially produced when the animals were given food deficient in both lime and phosphorus. The thickening of the bone resulted as an effort on the part of nature to fortify the weakened bone by depositing isolated masses of cartilage and connective tissue—but it failed to calcify. This disease in cattle was also cured by the use of phosphorus. It is known that in children—and experimentally in dogs and cats—that rickets has been caused by an absence of vitamin "A," but vitamins do not come into action in cattle feeding excepting in the case of manufactured foods such as oil cake, &c. Therefore, in cattle, rickets and osteoporosis may be caused by a lack of phosphorus, and cured when this deficiency is made good. Osteoporosis is a deficiency disease which occurs in bones more or less fully developed, and consists of decalcification.

He showed that phosphorus deficiency could be detected by an analysis of the blood, and said that this method of diagnosis was now commonly used in South Africa.

### Summary of Conclusions.

In summarising the benefits to be derived from the use of phosphates, the lecturer pointed out that the mortality of cattle on the veldt, where phosphorus was supplied was 6.33 per cent. compared with 49.45 per cent. in the case of controls. Also, the fertility was 90.28 per cent. in the case of the fully nourished cattle as against 36.49 per cent. in the controls. In horses, phosphorus deficiency produced a remarkable form of osteoporosis, known in Australia as "big head," the tissues of the bone and cavities of the skull being filled up with new growth.

The lecture was admirably illustrated by a long series of lantern slides, clearly depicting the wonderful results obtained by feeding with bone-meal; and also by graphs of a most striking character.

At the conclusion, Mr. J. C. Brünnich, F.I.C. (Government Agricultural Chemist) said that, although the feeding of bone-meal to stock had been practised in Queensland for nearly twenty years, there had never been such a clear demonstration of its value. If farmers and pastoralists could read this lecture he had no doubt that it would play an important part in increasing the efficiency of production in Queensland. He was convinced that by such systems of proper scientific feeding the carrying capacity of land in this State could be increased by at least 50 per cent. The lecture was specially important because the conditions in South Africa closely approximated those in this State.

Mr. A. J. B. McMaster (president of the Pastoralists' Association of Queensland), in seconding the vote of thanks, said that the carrying capacity of the Western pastures was much less to-day than it had been thirty or forty years ago, although millions of pounds had been spent in effecting improvements. There was no doubt that there was some deficiency in those pastures, and, perhaps some method such as Sir Arnold had described could be found to supply what was missing. It was due to the Federal Government that they were receiving visits from such distinguished men as Sir Arnold Theiler, whose expert knowledge would be of inestimable value to the primary industries upon which Queensland so largely depended.

### Australian Research.

Research into the relation between phosphorus and the health of animals has not been neglected in Australia. Professor Brailsford Robertson, of the Adelaide University, having conducted investigations for the last five years, while in Queensland, Mr. Brünnich and Major A. H. Cory, M.R.C.V.S. (Chief Inspector of Stock) have been especially interested in the subject. Future research at the University is designed to embrace an examination of soils from different districts with a view to discovering whether they carry phosphoric acid and lime in the proportions requisite to form bone. To aid in this work the composition of bones from sheep from various districts will be studied, and the suitability or otherwise of the soils gauged from that.

**ACHIEVEMENTS IN AGRICULTURE.****SCIENCE AND MODERN FARMING.**

Lectures by Sir JOHN RUSSELL, O.B.E., D.Sc., F.R.S., Director of the Rothamsted Experimental Station, Harpenden, England.

*"In 1898 Sir William Crookes predicted that the world in 1931 would require 90,000,000 tons of wheat to feed its population, and that this represented the utmost the world could produce. After that the world would be faced with starvation. The advance of science in agriculture has upset that calculation. Sir William Crookes' limit was exceeded in 1911, and could be enormously increased to-day. The fear of world starvation has fled before the advance of science. The problem before the world now is to ensure that the farmer shall get his fair share of the profit so as to encourage him to use all the knowledge that science can teach."*—Sir John Russell.

IT has been customary of recent years for the Australian Universities to unite in extending an invitation to some distinguished scholar to visit Australia, and deliver lectures upon his special subject. The visitor for 1928 is Sir John Russell, O.B.E., D.Sc., F.R.S., at present Director of the Rothamsted Experimental Station, Harpenden, England. To his fine academic record, Sir John Russell has added an extensive practical experience, and his published works, on subjects of agricultural interest, have earned for him a world-wide reputation. Born at Frampton-on-Severn in 1872, Sir John Russell was educated at the University College of Wales, Aberystwyth, and Victoria University, Manchester. He held various academic posts before he was associated with the Rothamsted Experimental Station; he was Technical Adviser to the Food Production Department, a Member of the Munitions Inventions Panel, and a Member of the National Salvage Council during the war period.

His publications include the following:—

- The Fertility of the Soil;
- Soil Conditions and Plant Growth;
- Manuring for Higher Crop Production;
- Farm Soil and its Improvement; and
- Plant Nutrition and Crop Production.

Some of the most remarkable developments of modern times are incorporated in the achievements of science in the agricultural field, and when these were presented by such an eminent scientist as Sir John Russell in the form of a public lecture, the first of a course of two, in Brisbane on 19th July, the subject proved to be of absorbing interest.

The Vice-Chancellor of the University, Dr. W. N. Robertson, presided, and the large audience included Sir Arnold Theiler, members of the Senate and Faculties of the Queensland University, Mr. E. Graham (Under Secretary), Mr. Robt. Wilson (Assistant Under Secretary), and a large number of officers of the Department of Agriculture and Stock.

**Science and Modern Farming.**

Sir John Russell dealt with the subject of "Science and Modern Farming," and his lecture was illustrated with an excellent series of lantern slides. He prefaced his address by paying a tribute to Sir Arnold Theiler, who, he said, had dealt convincingly with the application of science to the animal husbandry side of farming. He said that in regard to agriculture the first problem the scientist had to face was to discover the food upon which plants lived, and this was solved in the 19th century by the botanists and physiologists in Geneva. That knowledge was steadily improved. When the facts were known, chemists and agriculturists were able to apply that knowledge to the feeding of crops, and thus in 1840 Lawes of Rothamsted and Liebig of Germany discovered artificial fertilisers.

**Artificial Fertilisers.**

Sir John divided the chief fertilisers in use into four classes—nitrogenous, phosphatic, potassic, and organic. The second great triumph was achieved, he said, when it was found possible to obtain this nitrogenous fertiliser from the air.

"Modern farming," he said, "may be said to have begun forty years ago, when the development of transport enabled farm products to be sent all over the world, and so broke the monopoly which the home farmers had previously enjoyed. It caused a revolution in farming, and science aimed at helping the farmer by enabling him to increase the production per acre, and in reducing costs by eliminating wastes and losses." The introduction of artificial fertilisers came in very opportunely, notably superphosphate, sulphate of ammonia, nitrate of soda, and potassic salts. These had added greatly to the productiveness of the soil, all over the world, giving larger crops of cereals, potatoes, sugar beets, and other products, and they were also being largely used in England and Europe, adding greatly to the carrying capacity of pastures, and increasing the production of milk and meat. The importance of superphosphates in developing agriculture in Australia was now well known. It had been established that fertilisers not only increased the crop; but altered its constitution and habits of growth. This was being used to influence quality, and especially to help the plant to adapt itself to different weather conditions. For instance, superphosphates encouraged root development, and, therefore, helped the young plant to become established, and to send its roots down into the moist subsoil—a very valuable quality in dry seasons. Sulphate and muriate of potash increased the efficiency of the leaf, and so helped the plant in a sunless season. This explained their importance in Northern Europe. In regions where the climate was fairly regular from season to season, this method of adjusting the crop to the climate by means of fertilisers was likely to be very useful when it was better understood. In the uncertain climate of England it had already proved useful in levelling good and bad seasons, especially for the growth of fodder crops.

### Costly Plant Diseases.

Another direction in which science is helping agriculture, said Sir John, "is in the production of new varieties of crops, better adapted to the conditions of the farm, or more resistant to disease than the old ones." These new varieties, he said, were being produced all over the world. In recent years there had been increases in the number of plant diseases, and in these times of efficient transport diseases were liable to be carried from one country to another. The most destructive disease in the history of mankind had been the ordinary potato blight (Irish blight). This was a native of South America, and about 1840 it swept Ireland with all the vigour of a new pest, destroying the potato crop upon which the peasants lived, with the result that thousands died in the terrible famine that followed. For forty years Ireland was never free from this disease. Of all the tyrants Ireland had, the potato blight was the worst. After forty years, science discovered a remedy—and it was found by accident. A vigneron in France discovered that boys were stealing his grapes, so he prepared a mixture which would have the effect of killing the blight with which the vines were affected, and also deter the boys from eating his grapes. He found that it effectually killed the mildew, so he tried it on potatoes that were blight-stricken, and it killed that disease also. It was thus that what is now known as Bordeaux mixture was discovered, and since then potato blight has been effectually controlled.

### Cultivation of Waste Spaces.

Another disease which was very troublesome was the wart disease in potatoes. Happily, after much research, an immune variety was discovered from which a number of other varieties had been raised. The result was that this disease, which would probably have proved a catastrophe, had merely been a nuisance.

"Perhaps the greatest triumph of science," said Sir John, "had been to bring into cultivation the waste spaces of the earth. First, the trouble had to be diagnosed. Sometimes it was lack of plain food; sometimes lack of water; sometimes too much acidity, alkalinity, or too much salt. Soil chemistry was now so well advanced that the trouble could be located without much difficulty." He instanced cases in which vast tracts in Egypt and California, had been rescued by science from devastation in this way.

### Irrigation Problems.

"Every irrigation area," he proceeded, "is likely to present problems as to the suitability of the soil or some other condition. It is, therefore, extremely desirable that there should be constant control by agricultural chemists so as to ensure that the sudden appearance of any salt or alkali trouble can be discovered in time to permit of steps being taken to effectually counteract it."

On the motion of Mr. Graham, seconded by Professor Goddard, a hearty vote of thanks was accorded to the lecturer.

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## SOIL FERTILITY.

### SIX ESSENTIALS.

SOME of the essentials of a fertile soil were outlined in Sir John Russell's second public lecture on Tuesday, 24th July. These included a sufficient supply of air, water, nutrients, a suitable temperature, depth for the plants to develop their roots, and the absence of injurious factors. The importance of irrigation and of green and farmyard manure in conserving and providing the necessary water supply was touched upon, and it was emphasised that all clays, which played an important part in determining the fertility of the soil, benefited by the addition of limestone.

The Minister for Agriculture and Stock (Mr. W. Forgan Smith), in introducing the lecturer, observed that there was no doubt as to the need for improving methods of cultivation in Australia, with a view to increasing the yield from the land, and by that means making conditions of living on the land more attractive to the people, and thus increasing the sum total of wealth produced in the State and Commonwealth.

#### Not a Problem for Chemists Only.

Sir John Russell said that by a fertile soil was meant a soil which would grow the plants they wanted it to grow. In order that this might be accomplished, it was necessary that they should give the plants the conditions that they required for crop growth. Not so long ago it was thought that soil fertility was simply a matter of plant food, and that the science of agriculture was simply a branch of chemistry. It was thought the chemist would be able to analyse the soil, and ascertain exactly what foods were lacking, and that then the farmer would be able to add those foods, and make an unfertile soil a fertile one. Chemists certainly had secured very great triumphs. They had succeeded in making a number of substances which were valuable plant foods, and had greatly increased the fertility of the soils. The discovery of superphosphates was an illustration. It was found that when superphosphates were added to the soil, it greatly increased in productiveness. It was now known, however, that it was only possible for the chemist to ascertain the deficiencies of the soil to a very limited extent, and it was much safer to make an actual trial of the soil and the various fertilisers to see which of the plant foods was deficient. A piece of ground was divided up into a number of plots. One of these plots would receive no fertilisers, others would receive nitrogenous, phosphatic or organic fertilisers, and the crops would be compared.

#### Plant Feeding—Certain Substances Essential.

There was an aspect of the feeding of plants which had only recently come into prominence, and that was recognition that plants required certain substances, certainly only in minute quantities, absolutely. If they had not got them, then they would not grow. It had been proved by experiments with broad beans that a soil containing all the recognised elements of plant foods was not sufficient. However, when boron was added in the form of borax they grew steadily, and became normal in every way. It was known that other elements were needed in this way only in very minute amounts. Certain soils appeared to be deficient in the necessary small quantity of manganese, and in those soils the plants produced certain disease symptoms. There were, in fact, diseases in plants which resembled deficiency diseases of animals and human beings. They were caused through the lack of some small quantity of an element which was vital to the growth of the plant and without which they could not develop properly. These elements were only slowly being discovered because it was a difficult operation to find them out. Already they knew of boron, manganese, and iron, and just a few others.

#### Six Factors in Fertility.

Experiments at Rothamsted had shown that the contention that the food of the plant was the controlling factor in soil fertility was not correct. It had been found that wheat would grow quite normal on a piece of land which had no manure for ninety years, whereas on land on which weeds were allowed to grow unchecked the plant was reduced in size, and quite abnormal. It had been shown, therefore, that weeds would, in a short time, do what ninety years of starvation had failed to do. Naturally, then, these experiments brought into prominence the fact that there were other things in soil fertility besides the provision of plant foods. Detailed studies in the laboratory had shown that six factors at least, were necessary in order that there should be a fertile soil. Firstly, there must be a sufficient supply of air to the roots, because plant roots breathed just like men and animals, and were easily suffocated and readily injured. Unless there was an adequate supply

of air in the soil plants could not grow. Then they obviously required water and nutriments, or foodstuffs. There, too, must be a suitable temperature and sufficient root space. This meant that the soil must be sufficiently deep for the plants to develop their roots properly. Some plants wanted a deep soil, but others could tolerate a more shallow soil. Then there must be an absence of injurious factors. Fifty years ago nutriments were the only things which were regarded as essential, but now a fertile soil must satisfy the other five conditions as well.

### **Importance of Suitable Soil Depth.**

Of all those, perhaps the most important was a suitable depth. If a soil was too shallow, plants could not grow well, no matter what was done. Shallowness of soil might be due to a layer of rock under the soil, or to a water table. It happened not infrequently in valleys and low-lying land, where the water table was near to the surface, that directly the roots touched the water they ceased to grow. Some plants were very intolerant of free water. Lucerne, for instance, would not tolerate free water, and failed to grow if the water table was too near the surface. A highly important factor with regard to the plant was the supply of water. That was determined, in the first instance, by the rainfall, but it was profoundly affected by the nature of the soil. When soil was examined closely under a microscope, it would be found that it was entirely distinct from grains of sand or mineral matter in that it possessed certain sticky qualities. Soil consisted of hard mineral particles, the sand or grit, colloidal materials, water, and air. If the soil contained a large amount of colloidal materials, then the spaces got filled up, and there was not much air present. Soil of that kind was very sticky. Sandy soil suited one kind of plant, and was not suited for all kinds of plants, in spite of its low power of holding water, and clay other plants. There were places, however, where the soil was so shallow that it was impossible to cultivate it economically. Deep sand always was well suited for fruit, particularly for citrus, and clay soils were found to be extraordinarily well suited for grass and fodder crops. An example of this occurred on the Darling Downs, where the soil tended to be sticky in places, and there it was found that lucerne would grow admirably. Under such conditions fodder crops of the grass and clover variety would grow well.

### **The Value of Clay.**

Recognition of the importance of clay had led to a detailed study of clay in the soil, and it now was known that clay played a great part in determining the fertility of the soil. Chemists had studied the composition of clay in the soil, and they found there were three different kinds: calcium clay, sodium clay, and acid clay. They had also found that clay was of the same constituents as ordinary salt. Under a high rainfall there was a tendency for the soil to become acid, and the proper way to deal with acid clay was to treat it with lime. In Queensland all three forms of clay were to be found. All these clays were greatly benefited by the addition of calcium carbonate, either in the form of limestone or gypsum. This rendered the soil less sticky.

### **Water Supply.**

After emphasising that it was very important to examine the lower portions of the soil, because soil fertility was not confined to the surface, the lecturer went on to say that it required a greater amount of water for crops than anything else. Of course, the best way to ensure an adequate water supply was to have a natural rainfall, and the second best was to have an irrigation system. Where there was neither a sufficient rainfall nor an irrigation system, a great deal could be accomplished by proper cultivation. Proper cultivation conserved the soil moisture, and it was one of the most potent factors in soil fertility. In the State of Utah the Mormons had made a fuller study of water conservation and irrigation than any community known. Where the rainfall was about 25 inches, the addition of organic matter, either in the form of farm yard manure, or green manures, was valuable in securing an adequate supply of water. They gave to the soil power to hold the water. As a fact it was common in England to grow a crop, and then allow the sheep to eat the crop on the land. The sheep were penned in, and kept closely on to the crop, and when they were removed the land had been well manured. This method of combining sheep with arable farming had led to a great improvement in agriculture, not only in Britain but elsewhere. The sheep kept up the supply of organic matter in the soil, and it was found that the crops grown after they were removed gave high yields. Some of the most prosperous times in agriculture in England had been when they successfully combined sheep with other arable crops.

### The Use of Green Manures.

The use of green manure also added organic matter to the soil. At present only a few crops were used for the purpose, but it was important to study a considerable range of crops to ascertain which was the best to use under different conditions. Cowpeas were largely used. Green manures had all the effects of farm yard manures in increasing the power of the soil to hold moisture, and making it easier to work, and they had the further advantage that they supplied valuable food to the plant. Leguminous green manures, such as cowpeas, supplied nitrates, which were lacking from soils in wet regions.

Sir John Russell also explained the effect of various minute organisms, both harmful and advantageous, on the soil, and referred briefly to the efforts made in England to produce organisms which were rather more severe in their influence on the soil than those in the wild state.

### VISITS TO THE AGRICULTURAL DEPARTMENT.

While in Brisbane Sir John Russell paid several visits to the Agricultural Department, and interested himself very keenly in the work of the scientific and technical services. He was apparently impressed with the progress in research and field activities as carried out by officers of the Public Service. On 23rd July he met the whole of the scientific and technical staffs, and addressed them at length on some aspects of soil science. His remarks were followed with intense interest, and at the conclusion of his address he was accorded a cordial vote of thanks on the initiative of the Under Secretary, Mr. E. Graham, seconded by Mr. H. T. Easterby (Director of Sugar Experiment Stations).



*Photo.: Miss J. Easton, Department of Agriculture and Stock.]*

PLATE 38.—FOREST AND FARM LAND—THE CHARMING COOCHIN COOCHIN COUNTRY,  
SOUTHERN QUEENSLAND.

If you like the "Journal," kindly bring it under the notice of your neighbours who are not already subscribers. To farmers it is free and the annual charge of one shilling is merely to cover postage for the twelve months.

**RAINFALL IN THE AGRICULTURAL DISTRICTS.**

TABLE SHOWING THE AVERAGE RAINFALL FOR THE MONTH OF JUNE, 1928, IN THE AGRICULTURAL DISTRICTS, TOGETHER WITH TOTAL RAINFALL DURING JUNE, 1928 AND 1927, FOR COMPARISON.

Divisions and Stations.	AVERAGE RAINFALL.		TOTAL RAINFALL.		Divisions and Stations.	AVERAGE RAINFALL.		TOTAL RAINFALL.	
	June.	No. of Years' Records.	June, 1928.	June, 1927.		June.	No. of Years' Records.	June, 1928.	June, 1927.
<i>North Coast.</i>					<i>South Coast—continued:</i>				
	In.		In.			In.		In.	
Atherton ...	1.58	26	0.28	4.10	Nambour ...	3.67	31	2.88	3.37
Cairns ...	2.86	45	0.58	1.84	Nanango ...	2.04	45	2.63	2.94
Cardwell ...	2.02	55	1.74	4.81	Rockhampton ...	2.17	40	1.27	3.97
Cooktown ...	2.03	51	0.35	1.80	Woodford ...	2.86	40	2.46	3.18
Herberton ...	1.00	40	0.24	3.45					
Ingham ...	2.31	35	2.14	4.35	<i>Darling Downs.</i>				
Innisfail ...	7.14	46	1.73	10.96					
Mossman ...	2.10	14	0.40	2.65	Dalby ...	1.68	57	1.69	3.37
Townsville ...	1.27	56	0.48	4.17	Emu Vale ...	1.45	31	1.60	2.68
					Jimbour ...	1.70	39	1.89	3.14
<i>Central Coast.</i>					Miles ...	1.87	42	1.45	1.68
Ayr ...	1.33	40	0.75	5.19	Stanthorpe ...	1.89	54	2.60	2.71
Bowen ...	1.59	56	0.06	4.46	Toowoomba ...	2.42	55	2.60	4.12
Charters Towers ...	1.27	45	0.22	3.45	Warwick ...	1.77	62	1.59	2.83
Mackay ...	2.69	56	1.43	3.29					
Proserpine ...	3.46	24	1.17	4.29	<i>Maranoa.</i>				
St. Lawrence ...	2.45	56	0.96	1.82					
					Roma ...	1.67	53	1.70	0.93
<i>South Coast.</i>									
Biggenden ...	2.08	28	4.73	2.44	<i>State Farms, &amp;c.</i>				
Bundaberg ...	2.76	44	5.25	3.26					
Brisbane ...	2.76	77	2.22	3.21	Bungewongorai ...	1.63	12	1.84	0.96
Caboolture ...	2.64	40	2.56	2.75	Gatton College ...	1.83	27	1.95	2.68
Childers ...	2.40	32	4.65	4.01	Gindie ...	1.56	27	1.19	0.67
Crohamhurst ...	4.42	35	2.77	4.05	Hermitage ...	1.87	20	1.46	2.99
Esk ...	2.16	40	2.79	3.57	Kairi ...	1.47	12	0.19	2.43
Gayndah ...	1.85	56	2.87	1.82	Sugar Experiment Station, Mackay	2.42	29	1.11	3.08
Gympie ...	2.64	57	3.88	2.91	Warren ...	2.29	12	...	3.14
Kilkivan ...	2.15	48	2.85	2.14					
Maryborough ...	2.94	55	5.74	3.96					

NOTE.—The averages have been compiled from official data during the periods indicated; but the totals for June this year, and for the same period of 1927, having been compiled from telegraphic reports, are subject to revision.

GEORGE G. BOND,

Divisional Meteorologist.

**QUEENSLAND RAIN-FOREST TREES.**

By W. D. FRANCIS Assistant Government Botanist.

The tree illustrated in the accompanying photographs is *Endiandra discolor*. It belongs to the Natural Order Lauraceæ, which has many representatives in the scrubs or rain forests of Eastern and North-Eastern Australia. This species attains a height of about 120 ft. and a stem diameter of about 3 ft. In the large trees the stem is often buttressed and the buttresses frequently somewhat resemble those of the Carrabin (*Sloanea Woollsii*) in having their edges curving outwards. The species is confined to Australia and is found as far south as Gosford in New South Wales and as far as Rockingham Bay, Queensland, in the north.



*Photo.: W. D. Francis.]*

PLATE 39.—*ENDIANDRA DISCOLOR*. A TREE IN THE RAIN FOREST OF CEDAR CREEK TO THE WEST OF EUMUNDI.

The tree on the left of the picture is *Cryptocarya glaucescens*.



*Photo.: Dept. of Agriculture and Stock.]*

PLATE 40.—TWIG OF ENDIANDRA DISCOLOR.

## EFFICIENCY FACTORS IN DAIRY FARMING.

By L. MORIARTY, Dairy Inspector.

The most important contributing factors to success in dairying are:—

- (1) The magnitude of the undertaking, which may be measured by the area of land, the amount of working capital, and available productive labour.
- (2) The system of organisation.
- (3) The equipment required:—Economy in operation and adequacy of equipment have a considerable bearing on profits.
- (4) The adaptability of the soil, climatic and economic conditions to the enterprise.
- (5) The individuality of the farmer himself.

Discussing these factors in that order we arrive at the conclusion that it is important that the magnitude of the business should not exceed the managerial ability of the owner. It is quite true that it is much easier to make money on a large farm than on a small one, but, it is also true that the larger the business the greater the possibility of loss.

The amount of working capital required depends on the size of the farm and the type of its organisation.

One type of organisation may overload the labour at certain periods of the year leaving the other periods comparatively slack; while under another system the labour is distributed evenly throughout the season. Lack of system in dairying means lost time and useless work.

The character of equipment required we will discuss later.

Too much stress cannot be laid on the adaptability of the soil, climatic and economic conditions, to the industry, and this factor should be thoroughly considered before attempting operations or going to the expense of extensive improvements. The income per animal unit is a very important factor in profit; yield per acre is also important, but less so than income per cow.

Generally the economy of the business of dairy farming is based on the butter value of milk and production per cow.

The price of dairy products throughout the Commonwealth does not vary greatly, but in different localities the cost of production varies materially. Therefore, to be a success the industry should be confined to those districts or localities where the cost of production is lowest.

As regards the individuality of the farmer, it is necessary that he should be fitted temperamentally for his particular business.

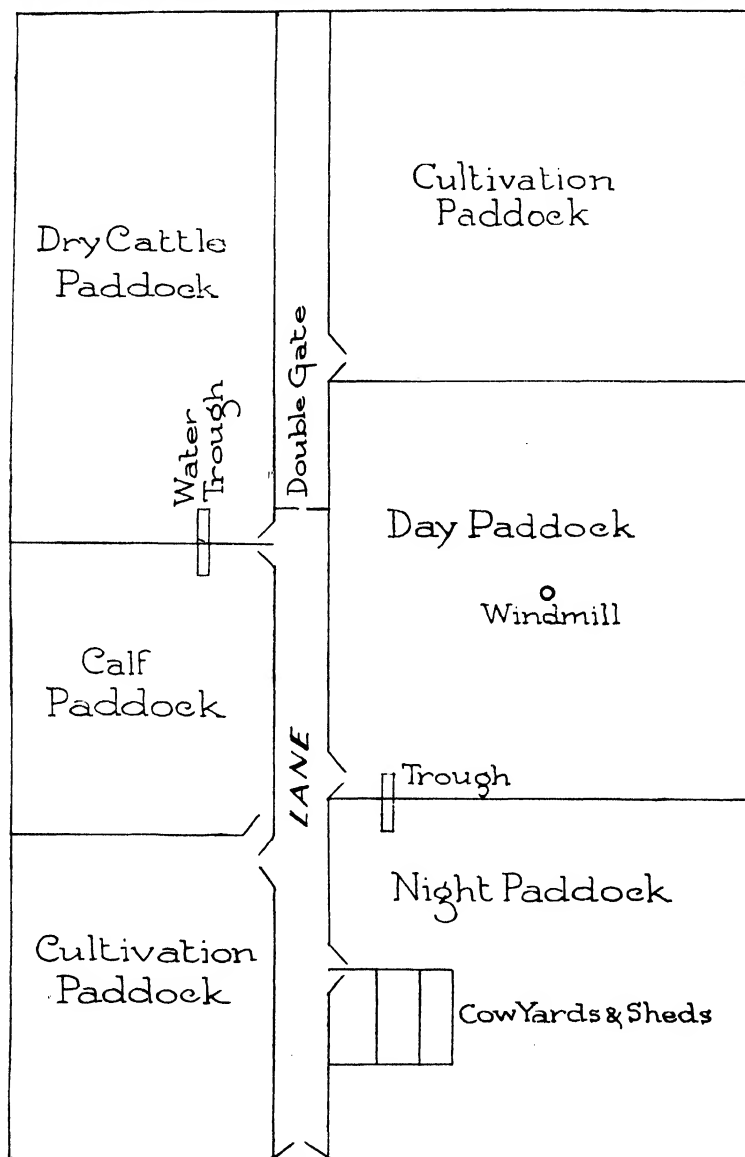
### Farm Lay-out.

The lay-out of the farm should really be the first consideration after a suitable block of land has been selected.

The new selector often dumps his camping outfit at the most convenient place for his immediate needs near water, or at the nearest point to the railway or township, and as time goes on he builds his home, yards, cowshed and dairy, and other improvements, only to find afterwards that he has double work in nearly all his operations, double cost in fencing, his cows have greater distances to travel to grass, and it is necessary to have an extra cowboy to bring them to the yard, not counting the time the animals waste when they should be feeding and producing more milk.

There are many ways according to the shape of the block or the contour of the ground in which an agricultural surveyor or farm planner could save the dairyman many pounds and much unnecessary labour (which would cut the cost of production) by surveying the block for the most easy and most economical working of the holding. This would be most opportune at the present time when so much new land is being selected in some cases by inexperienced settlers.

I have in mind a particular farm where the saving in labour and time through planning a lay-out, on the lines as shown in the accompanying sketch, is surprising. It follows that the profits are higher. This farm was cut into six paddocks with a lane running lengthwise through the block with access to all enclosures.



ROUGH PLAN OF FARM LAY-OUT.

It will be seen from the plan that when the cows are let out of the yard they enter a lane; and it is so arranged that there is only one gate open in the lane, and that gate leads to the particular paddock to which they are required to go. Two drinking troughs, placed at the corner of the paddocks near the lane gates, give the cows free access to water in all the grazing paddocks. When the cows are brought to the yards from the day paddock the night paddock gate in the lane is left open and the farmer is saved the time and labour of driving them. That is the idea worked in a small way, but it could obviously be enlarged upon.

### **Buildings and Equipment.**

In the construction of the bails or milking shed a big saving can be made in the use of strong timber of small dimensions or iron pipe stanchions for the internal railings and bail posts. The use of heavy bush timber of large girth takes up much of the floor space in a large shed.

Then the through bails or the crush bail system should always be used instead of the antiquated type of bails which makes it necessary for the stripped cows to be turned back into the receiving yard among those waiting to be milked. Not only is the time wasted by the milkers to be considered, but the weaker cows are knocked about considerably in a crowded yard, and there is, too, the waste of time for the high-yielding cow which is always anxious to get out to feed.

Crush bails are recommended where a large number of cows are milked—they are a great time saver.

Another time and labour saving idea can be arranged for the feeding of pigs in running the separated milk by gravitation direct from the dairy to supply tanks at the pig-sties. This is more easily arranged where the dairy is situated on higher ground than the pig pens, and may be constructed with an open guttering attached to boards or battens on a fence line running from the dairy to the pig feeding troughs. This guttering can easily be swilled out and cleansed by hot rinsing water from the dairy.

The fence panel connected with the dairy should be movable.

### **A Labour-Saving Silo.**

Following are brief particulars of a comparatively cheap labour-saving silo:—

Dimensions.—12 ft. in diameter, 20 ft. high, built 8 ft. under ground, and 12 ft. above ground level.

This does away with a costly elevator, and requires less power than would be necessary in filling a 20-ft. silo all above ground.

The under ground portion, 8 ft., is excavated and lined with smooth sandstone; the crevices are filled with cement and smoothed. The over ground portion, 12 ft., is constructed of brick, but not necessarily as strong as a silo wholly constructed above ground.

The pit portion is easily filled from the cutter, while the portion above ground is filled by a light gear elevator, home made, without much exertion. Emptying the top portion is as easy as the bottom portion, with the exception of the last 2 ft. However, this is soon overcome, and the farmer is compensated for this by the low cost of erection and filling. This silo is filled more often than a higher and more cumbersome silo would be owing to the lesser trouble entailed.

### **The Cow.**

The chief equipment or machinery on the dairy farm is the cow, for after all she is the machine that turns the raw material into a saleable article. In all other industries the business man considers the producing capabilities per unit of his machinery, whether it be for boots, clothing, newspapers, or ironmongery, and tries to obtain the most efficient and most economical plant, yet there are many men in the dairying industry who do not consider the efficiency of their main machinery—the cow.

It is quite possible for a dairyman—if he is serious in his business and sets a standard of efficiency—to increase the production per unit by the simple method of herd testing and culling systematically.

Many dairymen have reached the standard very quickly through having the capital to purchase a ready-made herd, but have turned out failures through the lack of knowledge in the after care and attention of their cows. The two most common faults are—

*Lack of raw material provided, irregularity in the hours of milking, and consequently irregularity in the hours of feeding.*

**MR. G. B. BROOKS.**

Mr. G. B. Brooks, Instructor in Agriculture for the Central Division, is a son of the soil, having first seen the light of day on an Aberdeenshire farm. His native county in Scotland is famous the world over for its Shorthorn and Aberdeen Angus cattle and its Clydesdale horses, and he picked up many points in animal husbandry that proved very useful in after life. The practical side of arable farming was also absorbed by him at an early age, a sound knowledge that was rounded off later by

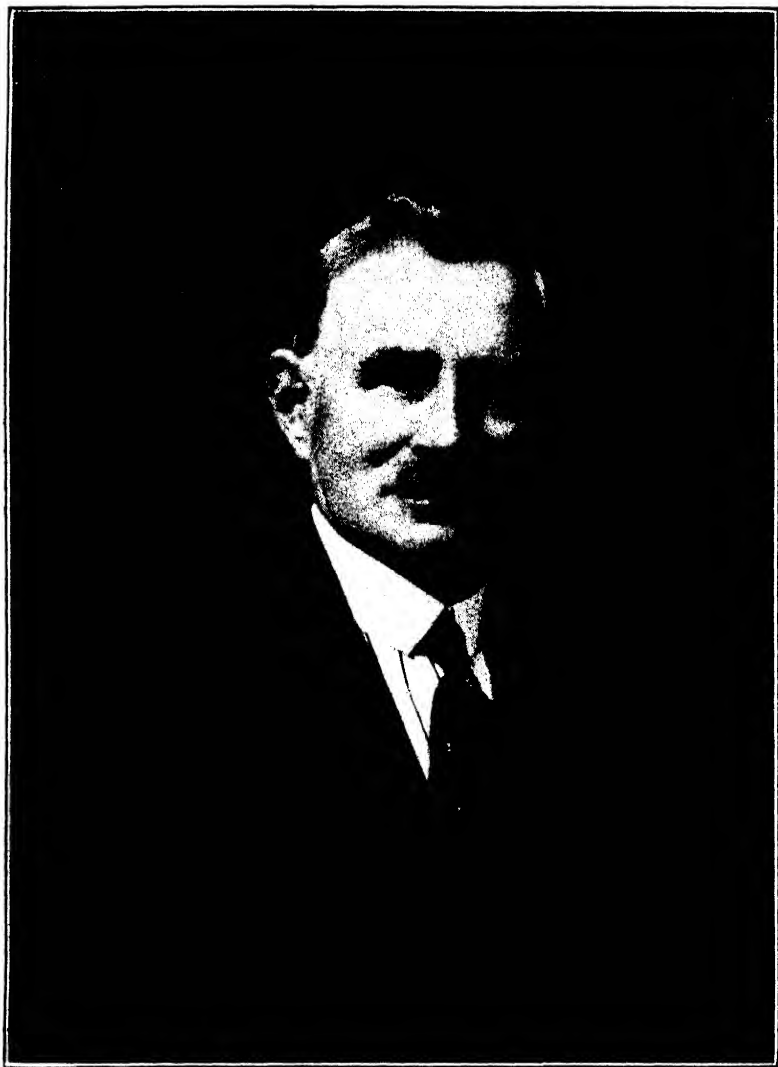


PLATE 41.—MR. G. B. BROOKS, INSTRUCTOR IN AGRICULTURE, CENTRAL DISTRICT.

a course in agricultural science at the Aberdeen University, to be followed by special courses in botany, geology, chemistry, and animal husbandry.

Feeling the urge that most young Scotsmen experience when the call comes for the wider spaces and the greater opportunity, Mr. Brooks migrated to Queensland. In his new environment he soon made good, and afterwards was appointed assistant manager of the Agricultural Experiment Station at Mackay. Here he was given

immediate charge of the Tryon collection of New Guinea sugar-canes, which have had pretty well the same influence on the sugar industry in Queensland as Farrer's wheats have had on grain-growing in Australia. Mr. Brooks was afterwards transferred to the Kamerunga State Nursery, Cairns, where he was faced with the many problems of tropical agriculture. These covered experimental work in the cultivation of tea, coffee, cocoa, rubber, cotton, sugar, and tropical fruits.

When the management of the Biggenden State Farm became vacant Mr. Brooks was selected for the job. His activities there included orchard and vineyard work, and the raising of dairy and pig fodder crops. Mr. Brooks's next move was to the Queensland Agricultural College at Gatton, where he had charge of the agricultural section and, on occasion, acted as Principal.

The position of Agricultural Instructor was then created and Mr. Brooks was selected for the position. The State, for organisation purposes, was subsequently divided into three major agricultural districts, and he became Instructor for the Central Division.

Recently Mr. Brooks was commissioned by the Government to visit Java, for the purpose of studying the latest methods of cassava culture and of procuring cuttings of high-yielding varieties to be grown for the extraction of power alcohol.

Mr. Brooks takes an active interest in all agricultural matters, particularly show work. He visited the Empire Exhibition at Wembley, and while in the Old Country embraced the opportunity of inspecting the many plant-breeding, seed-testing, and animal nutrition stations there. Considerable time was also spent among the stud breeders of Shorthorn and Aberdeen Angus cattle and Clydesdale horses.

Water-finding has been another valuable interest of Mr. Brooks's, and he has carried out much research work in the location of underground streams, more particularly in respect of the influences that operate on the "divining rod" and other mechanical appliances. As a result of these investigations he has designed and patented an automatic water-finder. Mr. Brooks is also a capable writer on agricultural and related subjects.



*Photo.: Miss J. Euston.]*

PLATE 42.—BELOW THE FOOTHILLS OF THE MACPHERSON RANGE, SOUTHERN QUEENSLAND. A FIELD OF MAIZE ON COOCHIN COOCHIN.

## FARM TRACTORS—BRAKES AND SPEEDS.

By E. T. BROWN.\*

Most tractors are fitted with the internal-expanding or external-contracting type of brake. Each is easy to adjust, and should be set in such a way that there is no friction when the brake is not being used, yet it should grip well when it is applied. From time to time it may be necessary to reline the shoes, but this is quite a simple task, and any good amateur can manage it. The best lining to employ is that made of asbestos and brass wire woven together, and this can be obtained from any motor store or garage. Holes should be drilled in the fabric to correspond with the holes in the shoes and copper rivets should be employed. The holes must be countersunk so that the rivet heads will sink well into the fabric. Inattention to the brakes may result in a serious accident and thus they should always be kept correctly adjusted.

### The Correct Speed.

The tendency with all drivers when they realise that they have a powerful engine under them is to get as much speed out of the outfit as possible. It is difficult to conceive of a greater mistake. With ploughing, for instance, a speed of  $1\frac{1}{2}$  to  $2\frac{1}{2}$  miles an hour is quite sufficient; in fact, in many soils the latter is considerably too fast. Again, on the road the driver should never try to force the speed above that for which the machine is designed. Even a slight increase over the normal will result in an additional strain being put on the machine out of all proportion to the amount of the increase. This added strain will show itself by rapid wear and tear of the working parts.

### Steering.

Steering is not a very strong point with the majority of tractors, and sufficient attention has not been paid by manufacturers to this part of the machine. Much can be done, however, to remedy this defect by paying particular attention to oiling and greasing, also to the correct adjustment of the various working parts. This part of the outfit should be looked to every day without fail. There are two kinds of steering gear in use at the present day, namely, hand and mechanical steering. The first named is effected by means of a wheel on a steering column, working on a worm and pinion drive, with suitable attachment to the front wheel or wheels. Of hand-steering devices there are two in common use. The motor car type (or Ackermann type as it is called) is employed almost exclusively on the lighter makes of tractor, whereas the traction-engine type, or chain barrel form, is generally adopted for the heavier machines. In the case of the Ackermann type of steering, the wheels are mounted on stub axles connected with the ends of the main axle. In the other form the wheels are mounted directly on the main axle, which is pivoted in the centre.

### Mechanical Steering.

To explain the working of the system of steering by mechanical means that is adopted on the majority of track tractors and on some of the two and three-wheeled machines, it is necessary to refer to the differential. Without going into details with reference to this device, it can be stated that by its use one driving wheel is enabled to travel at a faster rate than the other. This, of course, is primarily intended to facilitate the work of turning, for, were not some such contrivance used, one wheel would drag. For steering purposes, it is arranged that either wheel can be braked at will, and in this way the machine can be turned in a very small radius. The tractor is fitted with a wheel and steering column, but instead of acting on the front wheel the movement of the steering wheel either way applies the brake to one or the other driving wheel.

### Automatic Steering.

Tractors that run with all the wheels out of the furrow require a considerable amount of steering. To overcome the disadvantage of the driver devoting too much attention to this point, many makes of machines are fitted with a device for automatic steering. This consists of a small furrow wheel attached to the off-side front wheel. It is a very simple attachment, yet one that answers the purpose admirably. It saves the driver a great amount of trouble, and in some cases makes it possible to dispense with an extra attendant for the outfit.

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\* In "The Farmer and Settler."



# "Wonderful Power Under All Conditions"

Tooradin, Vic.,  
26th July, 1927.

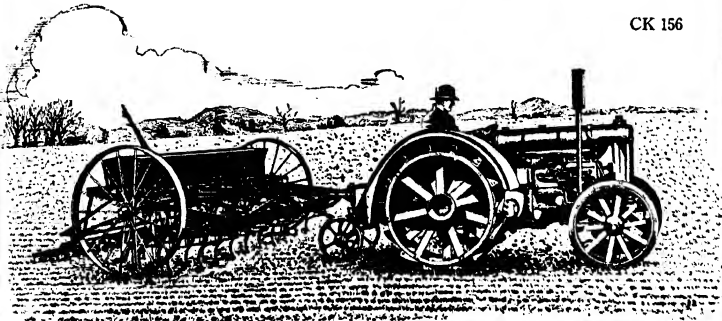
A few days ago I ordered 40 gallons of Cross Kerosene and 2 tins of Tractor Oil for use in my Fordson Tractor.

I should like to say that I am extremely satisfied with both of these products, as I find that Cross Kerosene gives me wonderful power under all conditions, and Shell Tractor Oil keeps my engine in splendid order, is clean, does not smoke, and gives me generally highly satisfactory results.

Wishing you every success,

(Sgd.) A. WYLIE.

*By using Cross you make a considerable saving  
in time and money, besides increasing  
the useful life of your Tractor.*



CK 156

## CROSS POWER KEROSENE

# A Vexed Problem

The greatest problem confronting the Agricultural Industry to-day is how to meet the high cost of production, and on its solution depends the prosperity of thousands of farmers and to a large extent the whole community.

## *A Question*

In reducing the cost of production lies the only avenue of relief, and the question is how can it be brought about?

The fact to nail up on the wall is that high prices are here to stay, and while the cost of labour is maintained so will the prices of every commodity remain at a high level. What is then the solution of the vexed problem?

## *The Answer*

Everything seems to point to the necessity for increased efficiency in production.

That there is ample room for improvement in this direction statistics reveal most clearly, as the average yields of our principal crops, such as sugar-cane, maize, wheat, cotton, potatoes, fruit, etc., are much lower than they should be.

## *The only Way*

While there is no doubt that the adoption of better methods of cultivation would result in an all-round improvement in yield, it would mean added cost. The obvious and apparently only means of increasing the average yield of crops per acre at a minimum cost seems to be by restoring and maintaining the fertility of the land by the more liberal and intelligent application of fertilizers. The object should therefore be "fewer acres—more per acre."

## *A good Investment*

There is no doubt that for a given expenditure on reliable fertilizers like "Shirleys" it will give a better return than on anything else and enable a substantial reduction to be made in the cost of production.

# Shirleys Fertilizers Pty. Ltd.

OFFICES AND WAREHOUSE:

Little Roma Street, Brisbane

Works and Laboratory: At Gladstone

## REARING QUEEN BEES.

### HINTS ON THE SELECTION OF STOCK.

By RUPERT HOLMES, Instructor in Poultry Raising and Bee-keeping at the Queensland Agricultural High School and College, Gatton.

There is a growing tendency among bee-keepers to rear their own queens, not only on account of the saving of the purchase price, but because the bee-keeper who has pure stock can, by careful selection, improve his strain by breeding from his most desirable colonies. Annual requeening is now recognised as not only desirable but very necessary. The ordinary equipment, common in every apiary, is sufficient for the rearing of queens for home use. Bee-keepers who wish to rear a large quantity of queens each season usually prefer special equipment and adopt the methods of the professional queen-breeder.

Of first importance is the stock from which the queens are to be reared. In every apiary there are usually one or two colonies which produce an unusually large crop of honey. This fact alone is not sufficient to prove that the colonies should be used for breeding purposes. Unless the queen is pure and purely mated, as indicated by the evenness in colour and size of her offspring, and of her daughter's drones, then the bee-keeper cannot hope to find her desirable qualities transmitted. Other qualities, such as comparative gentleness of the workers, quietness on the comb, size, resistance to bee diseases, a non-swarming tendency and perhaps length of tongue, should all influence the bee-keeper in his selection of breeding stock. Since it is impractical to control mating, attention should also be given to the selection of drones. By giving the most desirable colonies plenty of drone comb, by restricting the amount of drone comb in undesirable colonies, and by trapping the undesirable drones, any bee-keeper may increase the probability of desirable mating.

### The Time to Begin.

For best results the bee-keeper should commence to rear queens towards the beginning of the honey flow. At this time it is easiest to imitate the natural conditions under which queen-cells are normally produced—namely, the development of the swarming impulse, or the condition of the queenlessness. When ready to commence queen-rearing, say, about September, October, or November, the breeder-colony is prepared by temporarily removing from the brood nest all available egg-laying space. An empty comb in which no brood has been reared is then placed in the centre of the brood-nest and allowed to remain five days.

At the end of this time the comb should be filled with eggs, many of which will be just hatching, and therefore of the right age for queen-cell material. On the morning of the fifth day a nurse-colony or cell-building colony should be prepared. A colony which is just preparing to swarm will serve the purpose or one that is trying to supersede its queen, but the best results will be obtained when a colony is specially prepared for the occasion. The cell-building colony must be full of young bees and queenless. To prepare this colony, several combs of emerging brood, without bees, may be put in a hive body above a queen-excluder for three to five hours. The colonies from which the brood is selected for this purpose should be overflowing with bees or of swarming strength. Three to five hours after the combs of emerging brood have been "put up" they will be covered with young nurse-bees, and the nurse-colony is then prepared by placing the combs with their accompanying bees in a one-story brood nest. It is essential to make sure that no queen or queen-cells are present in this nurse-colony. It is also well to put grass in the entrance of the nurse-colony, to prevent the return of any bees to their former locations. Two combs containing nectar and a comb containing pollen should be placed in the brood-chamber of the nurse colony. In addition, when the nurse-colony is made up it is well to sprinkle the tops of the frames with sugar syrup made of equal parts of sugar and water. Having made up the nurse-colony on the morning of the fifth day, the comb which was placed in the breeder colony five days previously, and which now contains hatching eggs and day-old larvæ, is prepared during the afternoon for the nurse-colony.

### Preparing the Comb.

The method of preparation of the comb, although simple, requires care. The tiny larvæ are readily affected by excess heat, and should not be kept in the sunlight too long. If exposed to the wind they dry up quickly. They should not be kept out of the hive more than ten minutes. No matter how carefully other directions are followed, if the larvæ are damaged in preparation the remainder of the process is wasted effort. Observing the precautions mentioned, the comb of the cell material is prepared by destroying every alternate row of cells with a match.

The prepared comb is then taken to the nurse-colony and placed, prepared side downward, over an empty frame on the top bars, or on blocks of wood to raise the

prepared side of the comb at least 1 inch above the top bars. This space is to allow the bees to draw out the queen cells. A piece of canvas is placed over the comb of cell material with an empty super on top, filled with packing material to conserve the heat.

Four days later the bee-keeper will be able to tell how many queen-cells to expect, for all that are to be finished will be started by that time. Under no conditions should the nurse-colony be jarred or bumped while the cell material is being cared for by the bees. It is possible to get from eighty to one hundred queen cells from one comb of cell material by this method if the conditions are right. Twenty to forty cells are commonly made. When following this plan it is well to leave the cells with the nurse-colony until they are ripe or ready to hatch within the next twenty-four to forty-eight hours. This will be ten days after the nurse-colony receives the cell material. The ripe cells must be protected or removed before any of their inmates emerge, or else all are likely to be destroyed by the first emerging queens.

### Queen-Mating Nuclei.

If the colonies to be requeened are of hybrid stock, it is desirable that the queen be mated to pure drones before being introduced, otherwise little progress in improving the quality of the stock can be accomplished. Queen-mating nuclei can be made from standard hives by putting in either two or three partitions, thus dividing the hives into either three or four compartments of two frames each. Each compartment must be made "bee-tight" from the one adjoining, and each compartment must be given an entrance on a different side from that of the adjoining compartment. When the nucleus is made up and given a queen-cell (taken from the nurse-colony) the entrance is closed with gauze so that no bees will desert; it is also well to put a piece of queen-excluding zinc over the entrance to the nucleus in case of robbing. On the day that the queen-cells are ripe, a nucleus may be made in each compartment by placing therein two combs taken from extra strong colonies—one comb of emerging brood with enough young bees to cover but without queen or queen cells, together with one comb partly filled with honey. The comb of brood is placed in the nucleus chamber next to the partition, and a queen-cell which has been cut out of the comb of cells from the nurse-colony may be fastened to this comb of brood on the side toward the partition.

Fasten the queen cell in place with a portion of comb which has been cut out of the side of the base of the queen cell. If these nuclei are made from strong colonies of warming strength, and if plenty of nectar is being gathered at the time, cell-protectors will not be necessary. If there is no honey flow in progress when the nuclei are being made up, the colonies from which the nuclei are made should be fed for the two or three days previous to the operation, and the nuclei should also be fed. Within two weeks after the ripe cell is placed in the nucleus the queen should be mated and laying eggs; she can then be introduced into the colony which is to be requeened. Much in the difficulty and labour of requeening comes from the work of finding the old queen. This work can be greatly facilitated by temporarily placing the brood-nest, in which the queen is laying, on another bottom board at the side of the old stand during the middle of the day. In a few hours the field bees in the hive will have returned to the old stand, leaving only young bees with the queen, in which case she is usually to be found with ease.

### Introducing the Young Queen.

After finding and killing the old queen the brood-nest is to be returned to the old stand, and the young queen introduced by any one of the following methods:—

*The Wire Cage Method.*—Inexpensive wire cages may be purchased ready made or they may be made at home, as follows:—Secure blocks of wood, each  $\frac{3}{4}$  inch thick by  $1\frac{1}{2}$  inch wide by  $2\frac{1}{2}$  inches long, and wrap a piece of wire screen 6 inches square tightly around one block; fasten with a tack. The other block is slipped into the opened end of wire screen thus made. The loose end of the screen tube is wrapped with fine wire just tightly enough to allow the loose block to be removed when desired.

To cage the queen the loose block is removed, the queen is placed in the hand below the cage, and immediately crawls up into the cage. The cage is then closed with the loose block and placed between the centre combs in the brood-nest. After twenty-four to forty-eight hours the queen is released from the cage.

*The Smoke Method.*—When queens are introduced by the smoke method a return trip at the end of twenty-four to forty-eight hours is unnecessary. In the first place the hive must be made air-tight. A standard hive in good state of repair seldom needs attention. The smoker should contain plenty of well-lighted fuel; a wad of green grass packed in the top of the smoker will cool the smoke nicely. When ready the hive entrance is closed to 1 inch in width, and the bees are smoked until they can be heard to "roar" distinctly. The entrance is then closed completely and remains

closed for about twenty seconds. The entrance is then opened enough to open end of the queen cage. A puff of smoke will then drive the queen out of the cage into the hive, while another three or four good puffs of smoke should cause the confusion.

The entrance is again closed for about three minutes, depending on the size of the colony and the temper of the bees. It must be understood that the colony which is being requeened is to contain neither a queen nor queen-cells at the time. If otherwise, the new queen will be immediately destroyed. It is convenient to introduce the new queen as soon as the old queen has been killed. If this is not possible and the colony remains queenless forty-eight hours or more, every comb must be carefully inspected for queen-cells before the new queen is introduced.

In all cases the colony should not be manipulated or opened within a week after introducing the new queen. A slight disturbance may cause the bees to ball and kill the new queen.

Queen introduction is very successful during a honey flow.

### PARASITIC WORMS OF POULTRY.

By P. RUMBALL, Poultry Instructor.

*In response to repeated inquiries for information on this subject, the following notes are reprinted from the Journal for March, 1926:—*

A LARGE number of animal parasites are found in the digestive tract of poultry, some of which cause serious disturbances of the digestive functions, while others again are apparently harmless. Those principally met with, however, can be classed as round worms (nematoda) and tape worms (Cestoda). The former variety, by reason of the fact that they are the most common, claim prior attention. Various varieties are found in the crop and proventriculus or glandular stomach, gizzard, intestines (both upper and lower portions), and the caeca or blind gut. The latter variety are responsible for serious losses and are particularly hard to expel. The accompanying plates should give poultry breeders some idea to what extent infestation is possible.

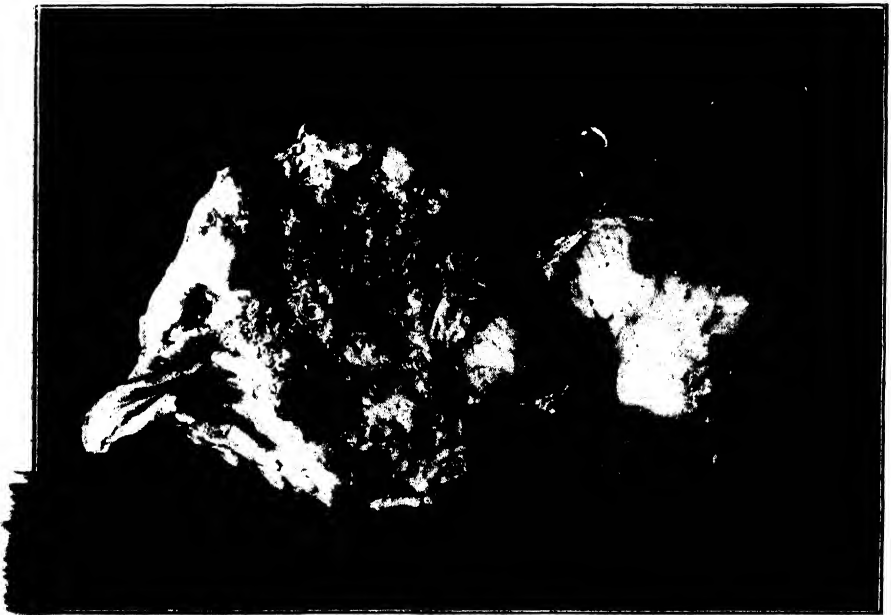


PLATE 43.—DISPHARAGUS NASUTUS WHICH INFESTS THE PROVENTRICULUS OR STOMACH OF FOWL (NATURAL SIZE).

That portion of the digestive tract between the crop and gizzard known as the proventriculus, or glandular stomach, is shown in Plate 1, heavily infested with worms. These worms were more or less encysted in the walls of the stomach, causing ulceration and eventually rupture.

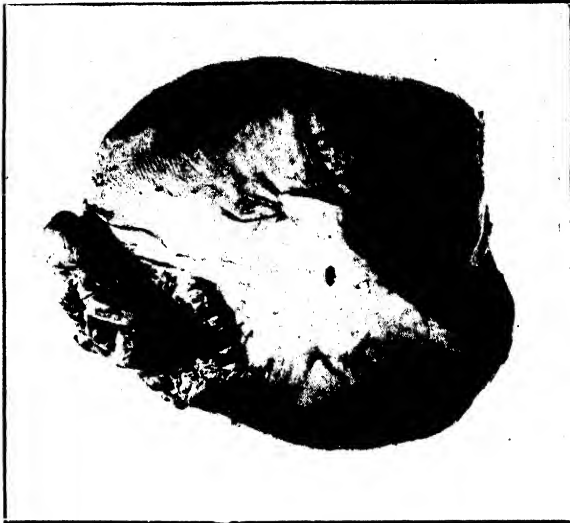


PLATE 44.—*SPIROITERA HAMULASA*, GIZZARD WORM OF FOWL  
(NATURAL SIZE).

From the above plates the nodules caused by the gizzard worm are illustrated. On examination of the lining of the gizzard perforation will be noticed, and on removal of the lining the end of the worm will frequently be seen protruding from the muscular tissue. They are difficult to extract complete and vary considerably in size.

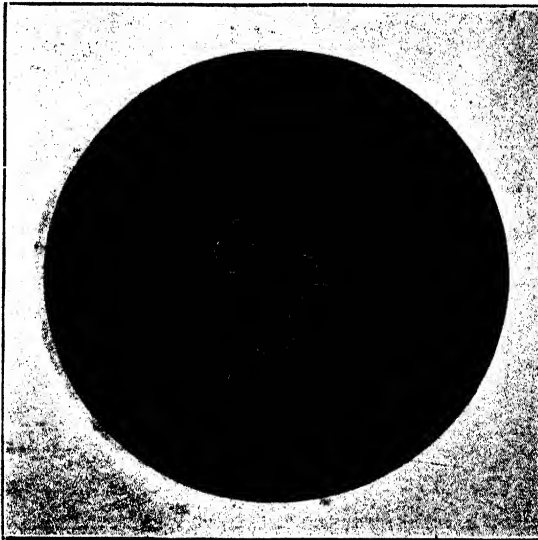


PLATE 45.—GIZZARD WORM (NATURAL SIZE).

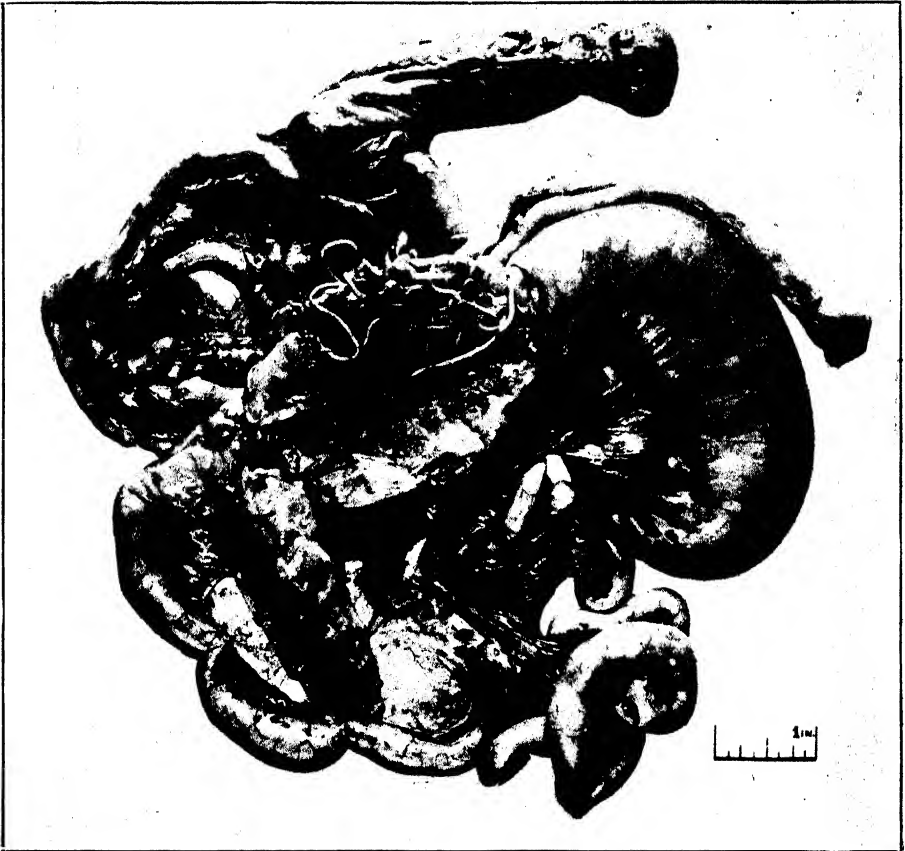


PLATE 46.—INTESTINE OF ORPINGTON HEN WHICH DIED OF STOPPAGE DUE TO TUMOUR AND BALLING OF WORMS.

This plate illustrates possibly one of the most common of intestinal parasites met with in poultry, and also the harm ensuing on their unchecked multiplication. In all probability the tumorous growth was due to parasitical infestation.

#### **Life History of Round Worms.**

It is not intended to trace in detail the life history of the various round worms found in poultry—in fact, in many cases it is unknown—but briefly with those most frequently met with. The adult female lays her egg in the digestive tract, which is voided in the excreta. This egg undergoes portion of its development in the soil, enters the digestive tract of poultry by adhering to portions of food, and there completes development. In order that correct development of the embryo worm takes place while it is in the soil, moisture is necessary, which accounts for the more general infestation met with in damp and wet yards. Numerous post mortem examinations have been made by the writer of unthrifty stock due to the presence of worms, and from conditions disclosed he is forced to the conclusion that propagation may take place by certain varieties of worms in the infested host itself. A study of the illustration lends colour to some extent to this theory.

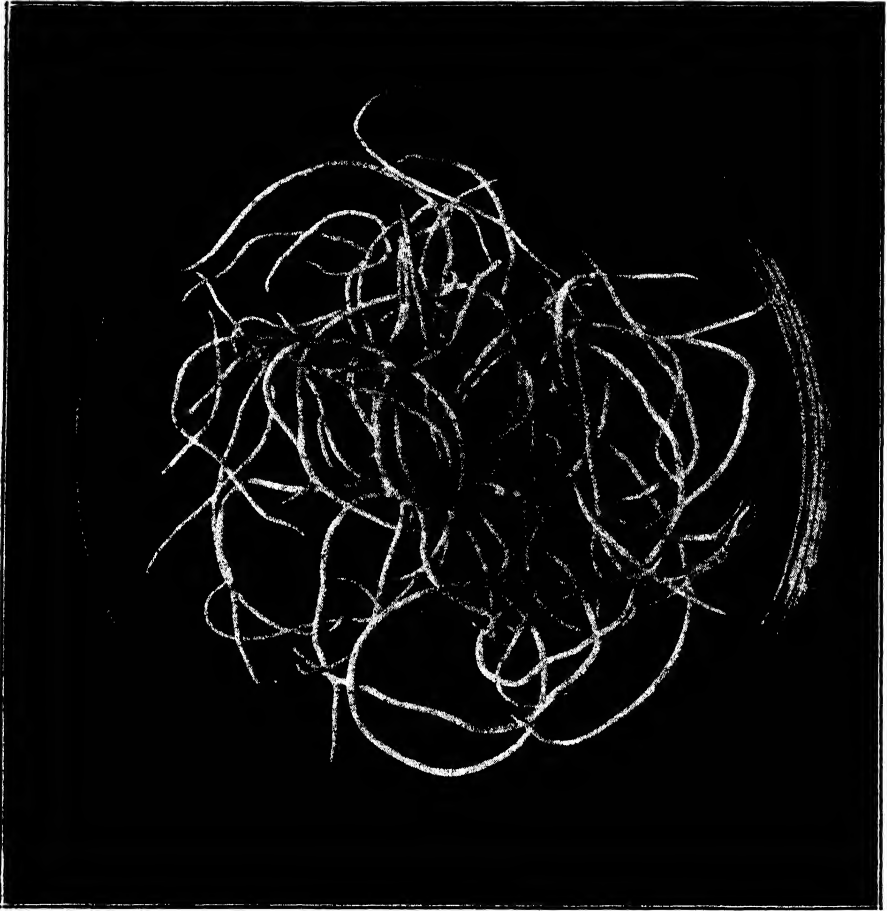


PLATE 47.—LONG ROUND WORMS (NATURAL SIZE) WHICH WERE REMOVED FROM INTESTINES OF BIRD ILLUSTRATED IN THE PLATE ON THE PRECEDING PAGE.

#### **Preventive Methods to be Adopted to Avoid Infestation.**

Having a general idea of the life history of round worms, what action can be taken to prevent general infestation? As worms are spread from bird to bird by eggs, infested stock should never be brought on to relatively clean premises. As the eggs are found in the excreta from infested stock, particular attention should be devoted to the regular cleaning up of droppings; by doing so you not only assist in preventing the spread of worms, but preserve your fowl manure in its most valuable form. It is impossible to thoroughly clean the runs attached to poultry buildings, but they can be spaded over occasionally and, where accommodation allows, spelled. The feeding of all mash foods, foods to which eggs would readily adhere, should be done in suitable receptacles, and where large numbers of birds are yarded together several should be provided to prevent portions of the mash from being spread about the yard.

Worm-infested stock are poor producers, and where infestation is severe the vitality of the birds is lowered, rendering them more susceptible to disease. Young chickens when hatched are of necessity free, and every effort should be made to maintain them in this condition, particularly so during their growing stage. To do this they should be reared on ground which has not been fouled by adult stock. Do not make use of chicken rearing pens, brooder houses, &c., as temporary quarters for stock of any kind; by strictly adhering to this principle it is possible to place in the laying pens well developed stock that will give results. On the other hand, if growing



PLATE 48. DREPANIDOTENIA  
INFUNDIBULIFORMIS.

a.—Worm ;

b.—An inverted piece of chickens intestine with numerous tapeworms attached.

stock become infested their growth is retarded and their vitality so lowered that they fall easy victims to diseases of an epizootic nature, such as roup and chicken pox, both of which are prevalent during the growing period and frequently assume a more virulent form with this class of stock.

### Diagnosis.

The symptoms which indicate the presence of worms are not very characteristic. The birds become dull, weak, emaciated, and sunken in face, losing all colour both in head and legs. The plumage loses its lustre and becomes roughened. Where infestation is not severe they are ravenous, but with the increase of worms their appetite diminishes, and they have no inclination to look for food. Their walk becomes stiff, and diarrhoea is often present. Generally birds infested with worms have the appearance of suffering from some chronic disease.

### Medicinal Treatment.

Too much reliance must not be placed on the ease with which worms can be expelled by medicaments, as the best are only partially effective. Therefore it should be the aim of producers to avoid infestation by every means in their power. Santonin is undoubtedly the best vermifuge, but, unfortunately, it is too costly for general use. If used, give at the rate of 1 to 5 grains per bird in the mash. Tobacco dust has been used also with some degree of success by mixing 1 lb. with every 50 lb. of mash.

Medicated oil of turpentine mixed with equal quantities of cotton seed oil or linseed oil can be given by means of a syringe, in doses of one or two teaspoonfuls according to the age of stock. In administering this, every care must be taken to prevent its entering the wind pipe.

Before administering any of the following, fast the birds for twenty-four hours, then follow treatment in two hours by giving Epsom salts at the rate of 1 oz. to fifteen adult or twenty half-grown birds.

### **Tape Worms.**

There are many species of tape worms found in fowls. They, however, cause little trouble owing to severe infestation being rare. The tape worm requires an intermediary host. One of the species infesting poultry has for its intermediary host the common house fly, and another the earth worm. An excellent treatment for tape worms is oil of male fern, areca nut, or powdered pomegranate root bark. A heaped teaspoonful of the latter added to the mash for fifty birds occasionally will keep stock free from tape worms. Areca nut given in the mash at the rate of 10 grains per bird is also efficient, while oil of male fern should be given at the rate of 10 drops per bird. However, before administering any of the above the birds should miss a feed and medicinal treatment should be followed by a purge in two hours.

### **PIGS AT THE BRISBANE SHOW.**

E. J. SHELTON, Instructor in Pig Raising.

The pig section certainly will be a most interesting one this year, for in addition to the splendid display of Berkshires, Yorkshires, Tamworths, Poland-Chinas, Duroc-Jerseys, Gloucester Old Spots, Large Blacks, and Pinders, there will be a very fine display of eleven pens of prime quality bacon pigs competing in the Bacon Pig Carcase Contest, also several very fine litters competing in the Litter Weight Contest, while as an added attraction, a sow and litter will be displayed, the litter being about 5½ months old, ten pigs in number, with a total live weight very close to 2,240 lb., or an average of pretty close to 240 lb. each—a ton litter in every sense of the word. Of course, it is realised the market does not call for these heavy weight pigs, but the ton litter is being exhibited to demonstrate what is possible if the pigs are handled along correct lines, and are fed from birth on the foods available on any farm where special attention is given to these matters.

There will also, of course, be many other sows and litters shown, as well as champion prize winning pigs from various parts of the State. There will be the usual Young Judges' Competition in this section also, while the instructors in pig raising will be in attendance for part of each day to meet breeders and to discuss with them matters of mutual interest. The office of the Instructor in Pig Raising will be quite close to the Pig Section, and messages could be left there, or at the Agricultural Department's Court, arranging appointments, so that there should be no necessity to disappoint breeders desirous of meeting those whose special business it is to assist them.

### **Farm Boys' Camp.**

Another special attraction at this year's Exhibition of particular interest to members of pig clubs is the Farm Boys' Camp.

Twenty-four specially selected boys, members of Pig Clubs in different districts in Southern Queensland, have been invited to become the guests of the Royal National Agricultural Association for Exhibition week. A camp manager (Mr. Williams, of Maryborough) has been appointed to take charge of the boys, who will be comfortably housed on the Show Ground, and will, each day, visit certain sections of the Exhibition to meet the judges and others interested, and have a general talk about the exhibits in that particular section. At one or other of the meals each day, also, some prominent authority will speak to the lads for a few minutes, and they will have an opportunity of meeting, and listening to, many prominent people in the live stock world, whom they would otherwise probably not be able to meet at all.

This scheme is being fostered, not only by the Royal National folk, but also by the officers of the Department of Agriculture and Stock, and of Public Instruction, for it is to be an educational treat for these boys, such as a good many older folk would be mighty pleased to have, and would be prepared to pay a substantial premium to be able to enjoy. It is but another indication of the attention being given to these matters by those most interested in progressive educational extension.

### **The Pork Products Displays.**

Nobody should miss seeing the wonderful displays in the Meat Industry Hall and in the Court of the Department of Agriculture and Stock, and the annexe, for in these sections special displays of pork products are being arranged. In the Meat Industry Hall, quite an extensive display will be staged, not only of manufactured products but also of fresh pork and of the carcasses of one each of the pens competing in the Bacon Pig Carcase Contest. One could say, in all fairness to other sections, that the remarkable displays in the Meat Industry Hall last year were equal to anything that had been staged in any part of Australia, or even of other countries, and this year's displays are to be even better than last year's. The pork

products display in the Agricultural Department's Court, whilst not so extensive, will be of much educational value, and be well worth a special visit.

Altogether, there will be so much of interest and educational value at this big show that everyone who can possibly manage it should make a point of attending.

The displays of bacon, ham, and other pork products in the Dairy Produce Section, in the Trade Displays, and in the District and One Man Farm Exhibits, will be well worth seeing too, for they are of the very best it is possible to produce.

## VALUABLE STUD PIGS.

### SOW AND LITTER REALISES 720 GUINEAS.

Recent reports from the British Isles indicate that since the termination of the World War pedigree pig breeding has increased to a marvellous extent in the home-land, one firm of auctioneers alone (Messrs. John Thornton and Co.) reporting that they have handled no fewer than 50,000 pigs through their sale rings during the past nine years.

Special attention is called to the following records obtained at auction sale in the British Isles during recent years:—

Highest price for a sow and litter of any breed—720 guineas.

Highest price for single pig of any breed—700 guineas.

Highest average for a sale of any breed of pigs, 82 head averaged £122 15s. 2d. The following are but a few of the very high prices paid for stud pigs during the years 1920 to 1927:—

Boars.—During this period, boars in the following breeds have realised prices as follows:—Large Blacks, 570, 550, 220, and 170 guineas. Middle Yorkshires have realised 300 and 100 guineas. Large Yorkshire boars have realised 210, 150, and 100 guineas.

In sows, the top price was 720 guineas for a sow and litter at the sale of Lord Rosebery's stud in 1920. Other high prices in this breed were 340 and 170 guineas, paid in 1926 and 1927. The highest priced Gloucester Old Spot sow was one of Captain H. P. Hamilton's sows, sold in 1921 for 520 guineas. Mr. H. Groom sold, in 1922, one Large Black sow for 500 guineas. One of Mr. Robert Ibbotson's Tamworth sows sold in 1924 for 200 guineas, while in 1923 and 1925 two Middle Yorkshire sows realised 160 and 115 guineas. Two large White sows, sold in 1926 and 1927, realised 340 and 170 guineas respectively, and belonged to Mr. E. Wherry and Mr. G. Payne, well-known British breeders.

Berkshires also have realised exceedingly high figures, the top figure being reported in 1920, when the Duke of Westminster sold one Berkshire sow for 610 guineas. At the Reading Show sales in 1921 a Berkshire sow realised 400 guineas, while during 1919, at the same saleyard, 320 guineas were accepted for a selected Berkshire sow of excellent type and quality. Other sows realising high figures in this breed were disposed of at auction at 190, 130, 60, 66, and 46 guineas.

In Berkshire boars the top price reported was received at the Reading sales in 1920, when a boar realised 370 guineas; during 1921 and 1922 two boars sold at 200 guineas each, while during the years from 1923 to 1927 sales were reported at 76, 62, 75, 71, and 80 guineas.

Tamworth pigs did not appear to command such high figures, though the late Mr. Robert Ibbotson topped the boar sales with 150 guineas, also the sow sale with 200 guineas, both sales being reported in 1924. Major J. A. Morrison sold a boar in 1927 for 78 guineas and a sow for 42 guineas; while Mr. E. de Hamel, in 1920, secured 110 guineas for a choice quality young sow. Prices from 20 to 75 guineas were common during the periods named.

In Large Blacks Mr. T. F. Hooley sold a champion sow in 1920 for 700 guineas, while in 1922 Mr. H. Groom topped the sales with 500 guineas. Prices realised for other sows were as follows:—240, 220, 115, 100, 70, 60, and 42 guineas. In boars, prices were very high, as the following will indicate:—570, 380, 290, 280, 220, 170, 48, and 42 guineas.

Gloucester Old Spot pigs were in good request, and included among the highest prices paid for these were 600 guineas in 1919 at the R.A.S.E. sale for a boar, and 400 guineas at the same sale for a sow. Other high-priced boars realised 320, 200, 150, 75, 35, 32, 25, and 24 guineas. Other high-priced sows realised 320, 57, 30, and 20 guineas.

Prices like these would do a great deal to popularise stud pig breeding in Australia, though it is doubtful if the sale price of the young stock here warrants such high values. Prices, however, have improved remarkably during recent years for specially selected animals.

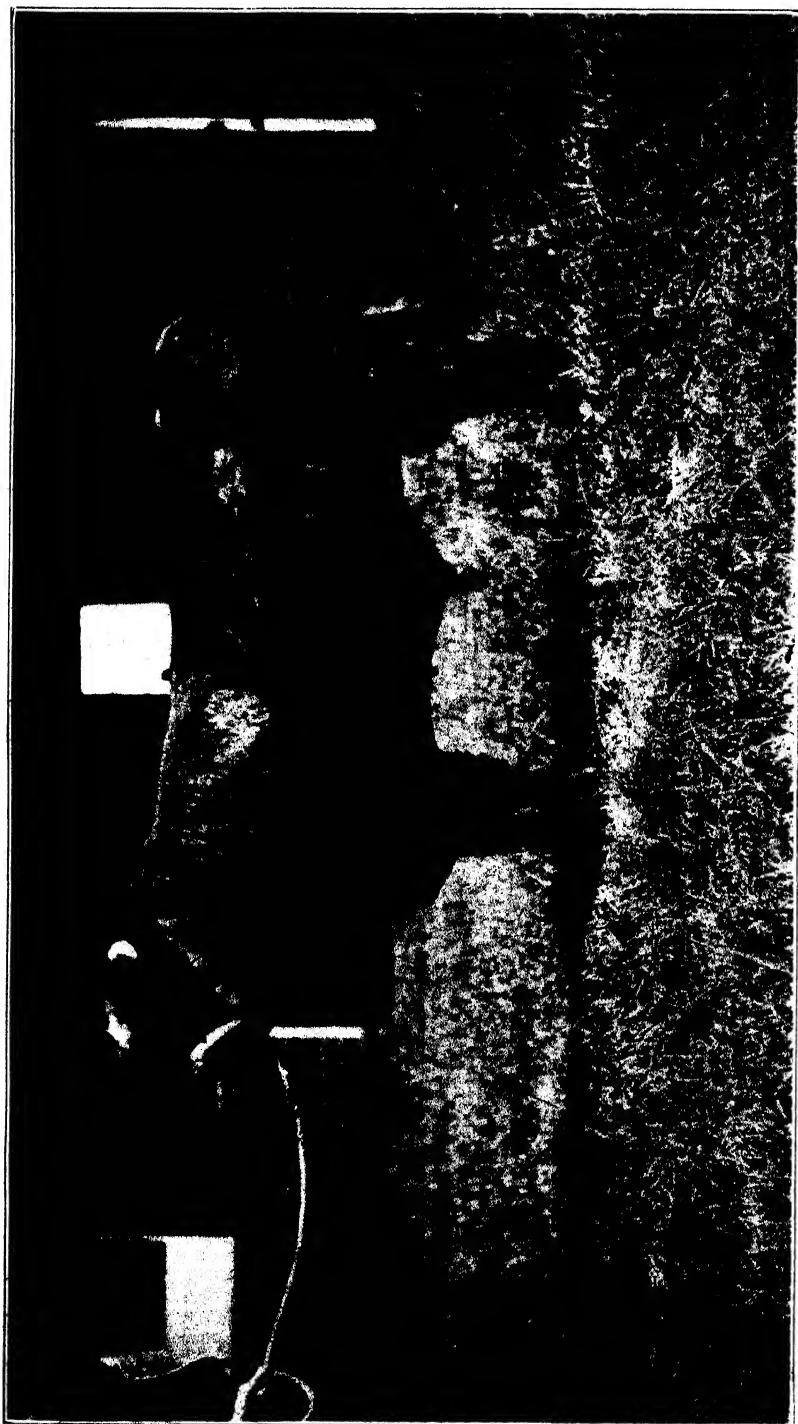


PLATE 49.—"COONONG MASTER-STROKE": AGE, FOURTEEN MONTHS.

Published by Department of Agriculture and Stock for Gindie State Farm Beef Shorthorn Stud. Sire, "Milton's Masterkey"; Dam, "Milton's Masterkey"; "Strawberry 2nd," by "Masterkey" (imp.) Photographed at Yeerongpilly Stock Experiment Station, twenty-seven days after inoculation for tick fever with "recovered" blood. Note his alert appearance after the ordeal.

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M'dme Scotney.

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Sir Harry Lauder writes:—"I have tried Heenzo and found it good."

The Antarctic Exploration Expedition.—"We proved Heenzo an invaluable remedy for chest and throat ailments under the severest Antarctic conditions."

Miss Gladys Moncrieff.—"Heenzo is a blessing to those who suffer from chest and throat ailments."

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## THE CULT OF THE COLT.\*

By "U 9 L."

### Putting on the Gear.

Now that we have the colt in hand is the time when bits of skin are occasionally displaced and odd scraps of hair sent flying. It's not done on purpose, of course, but such things will happen and we must be prepared for 'em. Many preparations are good, and among the best of them is a mixture of fat and kerosene in equal quantities. That's easy to make, it acts as a balm, as a hair restorer, and it softens the skin to effect easy healing. It's just as well to have a jam-tin of it, or, some other old tin, handy to use.

### The First Thing.

Let's get to the colt. The first thing in handling a youngster is to get right in on him. Lean your body against his, stand close all the time and use your own body as well as your hands in the handling process. It's safer so, any way. A man who stands well away is at a disadvantage. In the first place, it has a bad mental effect on the colt. It gives him the impression you're afraid of him, which isn't a bad guess on his part, and from a distance you may only converse with the thing over a 'phone, as it were. When you're standing in, leaning against the colt, you're in communion with him. You both gain mutual confidence from that proximity, and should he have evil intentions you pick up that malicious thought quickly and, if you're man enough, you stifle it at its birth. Also, if the thing is going to bound forward and kick or do something else which isn't in the lexicon of good manners, he's going to push you well clear during that bound if you're leaning against him. If you're standing out clear the colt's got free passage way to jump ahead and regard you as an Aunt Sally as he passes. Get in close and stay in—that's a standing rule without exception right through the whole curriculum of the colt's training.

### Treat the Colt Kindly.

One of the first things to do as soon as the colt is accustomed to us standing beside him is to bag him. An empty sugar bag is just the thing for the purpose. First get in close. Pardon that repetition, will you? It's the first rung of the ladder, and almost is it the whole foundation of success. Get in and keep in. You've a close hold on the halter-shank with your left hand, and with the right you commence to rub the youngster over with the bag. He'll flinch a bit, but very little. You'll rub him all over the near side, flap it over his back to the off side, and as the thing reaches the stage of ignoring the flapping bag you'll take further liberties with it. Holding the bag by one corner you'll commence to swing it wider of the colt and bring it in with a flick. Gradually you'll work over his rump and down his buttocks, and then you get a double-action flick—under his belly and over his back in one broken sweep. You pay attention to every part of his body, off-side as well as near, and you flap him till he ignores the thing completely.

But, whatever else you neglect to do, don't forget the mental effect you produce. Treat the colt in a friendly fashion, almost in a casual manner, and let him know you're not afraid and desire a reciprocity of feeling from him. For instance, and just to state a case: You're leaving the yard, we'll say, to attend to something else. Instead of laying things down carefully and treating the bag and colt as though they were flimsy egg-shells, throw the bag over his back or neck as you turn to leave, and do it as though it was a natural action and the proper thing to do. Colts are wise birds in their own little way—make no mistake about that—and the man who relies on physical effort alone when dealing with them is unnecessarily adding to his labours and making a drudgery of what should be a pleasure.

### Pick up his Feet.

If you wish you may now put the roller and bearing reins on him, or you may go on with a little more handling. Let's pick up his feet first. Any of these things may be inflicted on the colt at any stage of his education. But it's got to be done,

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\* From the "Pastoral Review" for April. Previous notes on this subject by the same well-informed writer were reprinted in the March "Journal" from the February number of the "Pastoral Review."

and the more we handle him the easier he is to handle. We'll pick up his feet. Get in close—I've said that before, haven't I?—and take a close hold of the halter-shank. If you grip that within an inch or two of the colt's cheek it's a form of insurance. The thing can't jump forward without its head going also, and if you've a good hold you also are lifted out of harm's way. For either of the front feet we stand in close and rub up and down that particular front leg with our foot. The thing may stamp a couple of times and otherwise show its displeasure, but it'll accustom itself to the process in a mere bit of time.

When it suffers our foot going up and down its leg we'll work the toe of our foot under its fetlock and lift. That may, or it may not, lift the colt's foot from the ground. It's immaterial, in any case. All our foot is doing is accustoming the youngster to us fooling about its legs. We're in a better position to protect ourselves while standing beside the colt than we would be did we lean down to lift its foot for a start, and in that way do we run less risk. In much the same way do we lift the hind foot, using our own foot first as a means to introduce our hand. It's easy—dead easy—and reduces the minimum of risk to a maximum of safety. After lifting each foot a couple of times we'll let it stop at that. There's no need to make drudgery of any one lesson. Those feet have to be lifted a dozen scores of times in the breaking process, and once the way is open the rest is easy. See?

### **"Mouthing Bits" Condemned.**

Now we put on the roller, the bearing-reins and the mouthing bit. We've bagged the colt previously, and before we slip the roller over his back we'll bag him again for a second or two. First, though, we've put on the bridle and introduced the bit to his mouth. Let me have a word or two to say about mouthing-bits, will you? We've all seen weird contraptions which pass as mouthing-bits. Almost, when a man sees some of them, he's inclined to think of the instruments of the Inquisition. They're not bits at all—they're things of fiendish torture! Why do they make such things? A colt's mouth is a tender thing, a dainty bit of mechanism deserving care. And yet you'll see fiendishly-shaped metal things specially made to inflict pain and torment! When you yourself are breaking in a new pair of boots does it add to the later comfort of those boots to put some grains of gravel in them while you walk about? Don't be silly, you'll say. I say it's not silly. If we put dingers on mouthing bits, curiously curved iron in the bit itself, and all sorts of other abnormalities, then if that's good for the colt the gravel's good for the man. There, now!

Anything, however, plain and simple it is, will cause the colt to chew and mouth himself. I always used an ordinary snaffle bit, a shade heavier than usual, perhaps, and after the first few hours I'd wrap rag soaked in that kerosene-fat mixture round the bit so it wouldn't bruise the tender young jaws. Don't try and tell me the thing won't work. I've run down a dingo in thick old-man gidgee on a green colt of my own breaking. He was a good colt, and my old heart goes out to him now even after this lapse of time, but you'll admit, apart from everything else, he was mouthed. Look, if you love your horses at all, and if you have any respect for your own humanity, throw away those fiendish mouthing bits, made only to inflict torture, and use something easier on the colt and which has common sense as a foundation of its build. I have finished, without promising I won't revert to the matter, and we'll get on with our work.

### **Slipping on the Gear.**

The colt stands easy enough while we slip the roller on him. The more bits of straps and other gadgets this has hanging about it the better I like it. Half of them mightn't be any use, and the other half may be almost unnecessary from a utilitarian point of view, but they're all educational. The more stuff we can have flapping about the colt the better it is for him and for us—it all does its little bit towards quietening him.

While you're slipping the roller on just let your eyes and hands feel every part of it. Particularly, please, see that it's soft with oil. It's an abominable thing to put a sweat-caked rig on the tender skin of a young colt. Goodness knows, the thing will chafe easily enough without us going out of our way to add to its discomfort. Though we may never use a crupper in his working life, the colt has to have a crupper now, and see that the loop of that crupper is soft and pliable as a bit of silk. Owing to the bagging he's received the colt almost ignores the gear going on him. But when we tighten the girth it's a new sensation. That tightening of

the girth is, in over 90 per cent. of cases, the inducement to buck. I've ridden horses bareback which took no notice of men, and yet when the girth's been laced round them they've hoisted—yea, they've gone up where the birds fly! And again, a case of which I might tell you when dealing with anecdotes and incidents, I've known a bad mare so girth-proud that she wouldn't, or couldn't, buck till she'd accustomed herself to the feel of the girths.

### A Warning.

All that's merely a warning to be careful when you're tightening the girths of the roller when first putting it on our colt. It has to be done, and we've got to do it. After you've tightened the girth to a reasonable extent let the colt move about the yard a bit before putting on the crupper and lacing the breastplate through the surcingle. That's just to accustom him to the feel of it, and so he may stand in more or less comfort while you see to the rest of the gear. When he's standing at ease you may adjust the surcingle and breastplate. There's only one warning I'd give in this: Please see that both surcingle and girth are approximately of the same degree of tightness, and for the love of goodness don't have a welt of flesh oozing out between them in much the same manner that dough squeezes through a cook's fingers. There's no better way of bringing about a severe gall than by showing culpable neglect in this.

The crupper's got to go on, and it's a delicate operation. Really, you know, it's not nearly as hard as it looks, and the danger's so slight that it's next to nothing. It's the fact of playing about a powder magazine which prompts the fear of an explosion. Take the rein in your mouth, gripping strongly with your teeth, after pulling the colt's head round. That gives you both hands free, and if you stand in close and hold tight with your teeth almost you're as safe as if you were in bed. Take this from me, as coming from one who knows: the danger is only in ratio to your fear.

Anyway, the colt's tackled, all the gear fitting nicely, none of it too tight, and the bearing reins are buckled back to the roller. The colt walks round and round, restlessly champing the bit, and can we go and leave him? We can't! We've got to keep coming back to that fellow ever so often, comforting him with our presence, handling him for no other reason than that it's part of his education, and always and for ever we're at that patient's beck and call while we have him under treatment.

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## ABSTRACTS AND REVIEWS.

### Bagasse as a Source of Industrial Alcohol.

WM. L. OWEN and WM. P. DENSON. ("The Planter," 1928, 80, 61-64, 83-85 102-105.)

Within the last few years the demand for bagasse in Louisiana for the manufacture of fibre board has grown with such astonishing rapidity that it seems within the realm of possibility that at no very distant period practically all of her bagasse will be used for that purpose. But its residual sugars contribute nothing to the purpose in view. Since these sugars give to bagasse a potential yield of 5 to 7 gals. of alcohol per ton, and are actually detrimental to the making of the board, it seems desirable to utilise them for the production of spirit, rather than lose them by leaching, or by the action of micro-organisms during storage. A preliminary investigation has very clearly demonstrated two things, viz.:—(1) That the fermentable sugars in bagasse can be very efficiently converted into alcohol by fermentation; and (2) that the addition of bagasse to fermenting solution tends to accelerate the rate of fermentation even where it does not increase the yields of alcohol from the sugars present. These investigations have now been continued, various factors being studied, as the effect of adding bagasse on the rate of fermentation of molasses worts of high density, effect of the fineness of the bagasse, the effect of the removal of the bagasse after the initial period on the rate of fermentation, and the effect of percolating fermenting wort over bagasse. As the result of this experimental work, details of which need not be given here, it is concluded that: "Where bagasse is used in molasses distilleries for the purpose of recovering its residual sugars as well as accelerating the fermentation of worts of high concentrations, the following would

be the procedure: The spent or exhausted chips of bagasse may be taken from the fermenting vats where they are separated from the wash, by screening or filter-pressing, and conveyed to vinegar generators where they are used just as wood shavings are used in vinegar plants. They may then be impregnated with a vinegar culture obtained from a previous run, and a dilute of alcohol solution, or preferably some of the diluted wash percolated through them. After operating through a cycle, the chips can be dried in the sun, and baled for use as a fibre board. Since only a low concentration of acetic acid is necessary for the prevention of mould growth, the time required for the material to pass through the generators should only be a few hours." In the light of the foregoing experimental results the authors then inquire what the value of bagasse would be in molasses distilleries compared with the present market value of fibre board. Calculated on the increase in alcohol yield from molasses wort of the usual setting density of 17 degrees Brix, it would be from 3 to 6 dollars per ton. In addition to this, would be the saving in time of fermentation, which would be at least one-third of that required under ordinary conditions. When we calculate the value of bagasse, however, for the fermentation of more concentrated worts, of from 33 to 40 degrees Brix, the above figures are greatly increased. In the latter case the value of bagasse enables one to do what would be impossible without it, or some other similarly acting substance. Increases in yield have amounted to 30 gallons of absolute alcohol, over the best obtained without it, giving a ton of bagasse the value of 100 gallons of black strap. In addition, the recovery of fertiliser from the slops becomes comparatively easy when the molasses is set up at that density. The present market value of bagasse for fibre board is based on the fuel oil required to take the place of the former in supplying the fuel for the operation of the mill. Taking as an average 220 lb. of wet bagasse, the operator received 4.20 dollars a ton for it, and in addition a small bonus. It would seem from this investigation that bagasse would be at least of equal value to the distiller, who, after utilising it for his purpose, could dispose of it to the fibre board manufacturer in a better condition for that purpose than when he received it.

### "The Fruitful Granite."

By HECTOR DINNING (author of "By-Ways on Service"; "Nile to Aleppo"), with a Preface by The Rt. Hon. Lieut.-Col. Sir Matthew Nathan, P.C., G.C.M.G., formerly Governor of Queensland.

This is a book by a writer of considerable experience—who already has two books to his credit—about the life and work of an orchardist on the Granite Tableland of Stanthorpe.

This is a unique countryside; unique in its climate and in its products, and even in its people. These characteristic qualities should be better known by Australians, and especially, perhaps, by Queenslanders—though, as Sir Matthew Nathan says in his preface, it is a book that should interest Englishmen, too. The author in these pages has reproduced the atmosphere of this locality, and has shown, besides, how the people engaged in fruitgrowing there react to it.

The story of the actual work of fruitgrowing in all seasons has been faithfully told in great detail—its pleasures and its pains, its risks, and their compensations. But this is no work based on hearsay. As the preface says: "The Fruitful Granite bears the impress of a truthful relation of actual experiences."

It should appeal not only to city dwellers—as giving them a picture of a life outside their own experience—but to all land-workers in other branches, who are always interested by stories of the craft of primary production that offer points of difference from their own.

The author, Mr. Dinning, is a young Queensland and a graduate of the Queensland University. He was with the A.I.F. on Gallipoli, in France, and with the Australian Light Horse in their epic advance to victory in the Palestine campaign, and returned home with the rank of Captain. His earlier books won strongly favourable notice in both the British and Australian Press. He is also well known as a writer of vivid and virile sketches in Australian daily and periodical journals. His long experience as a fruitgrower in the Stanthorpe district is the basis upon which he has written a book of delightful and arresting interest.

Our copy is from the publishers, The Carter-Watson Co., Ltd., T. & G. Building, Queen street, Brisbane.

## General Notes.

### Prohibition—Introduction of Infected or Suspected Swine.

Owing to the existence of swine fever in other States of the Commonwealth, an Order in Council was issued on the 14th July, 1927, prohibiting, for a period of twelve months, the introduction into Queensland of infected or suspected swine from New South Wales, Victoria, South Australia, Western Australia, and Tasmania. It has now been considered necessary to extend the prohibition for a further period of twelve months as from 14th July, 1928, and an Order in Council has been issued to that effect. This Order does not affect introduction of bacon, hams, and cured or dressed pork. Healthy pigs for immediate slaughter may, with the approval of the Minister, be admitted.

### Staff Changes and Appointments.

Mr. Geo. Tait has been appointed Assistant Cane Tester at the Kalamia Mill for the 1928 sugar season.

Mr. J. McG. Wills, of Nerang, has been appointed Honorary Inspector under the Diseases in Plants Acts.

It has been approved that Mr. R. J. T. Kidd, Inspector of Stock, Mackay, be transferred to Normanton, and that Mr. D. A. Logan, Inspector of Stock, Normanton, take Mr. Kidd's place at Mackay.

Mr. J. C. Pryde has been appointed Temporary Inspector of Slaughter-houses at Warwick as from 9th July, 1928, to 18th August, 1928.

The following have been appointed Temporary Inspectors under the Diseases in Plants Acts for the purpose of inspecting banana plantations in connection with the Bunchy Top investigations:—

S. A. Green, Brisbane;  
W. D. Lewis, Brisbane;  
R. Pritchard, Brisbane;  
R. E. Brown, Brisbane;  
P. Mitchell, junr., Currumbin;  
C. C. Parkinson, Coorparoo;  
E. L. Miles, Zillmere;  
R. D. B. May, Kurcelpa, Nambour;  
A. Chappel, Wamuran; and  
E. R. Nichols, Cambroon, via Brooloo.

These appointments are for a period not exceeding three months as from the date of commencing duty.

Messrs. L. J. W. Taylor and J. King, of Brisbane, have been appointed Inspectors on probation, Agricultural Bank.

Mr. R. F. Hobler, of Moyen, has been appointed a Member of the Windorah Dingo Board, vice Mr. N. P. Saywell, resigned.

Mr. M. R. Muller, of Hamilton, has been appointed Temporary Inspector of Stock.

Misses G. E. Dingle, C. Humphries, and A. S. Mullin have been appointed Assistant Cane Testers at Marian, Millaquin, and Moreton Mills, respectively.

The District Inspector of Stock, Rockhampton, has been appointed Government Representative on the Gogango Dingo Board, vice the Police Magistrate, Rockhampton, resigned.

The appointment of Mr. G. R. I. Anderson as Inspector of Slaughter-houses has been confirmed, as from the 5th December, 1927.

The Officer in Charge of Police, Mungindi, has been appointed Inspector of Brands.

Mr. C. L. Moran, Inspector under the Dairy Produce Act, Rockhampton, has been appointed Dairy Instructor, Department of Agriculture and Stock.

Constables J. A. Holley (Bollon) and C. J. Nugent (Injune) have been appointed Inspectors of Brands.

Mr. T. R. Kennedy, Police Magistrate, Bowen, has been appointed Chairman of the Inkerman, Kalamia, Pioneer, and Invieta Local Sugar Cane Prices Boards for the 1928 season, vice Mr. R. A. Tait, resigned.

### The Wheat Pool.

Mr. W. Forgan Smith, Secretary for Agriculture and Stock, has announced that on the 28th of April last a Proclamation was issued extending the Wheat Pool Acts so that they would apply to all wheat harvested during the seasons 1928-29 to 1932-33, with the stipulation that if 500 growers of wheat who delivered wheat during the seasons 1926-27 and 1927-28 petitioned before the 1st June, 1928, for a referendum as to whether or not a poll was to be taken, and if upon such poll the majority of votes recorded was against the extension, the Proclamation would not take effect. The complement of 500 growers represents about 10 per cent. of the total number engaged in the growing of wheat. However, no such petition was received, and the Wheat Pool will accordingly continue to function until 1932-33.

Prior to the issue of the Proclamation in April last, petitions from various sources were received, asking for an extension of the pool, and these were signed by 400 wheatgrowers. There was also a petition received towards the end of last year, asking for a referendum before the pool was extended. This was signed by ninety-seven growers (this number of growers would be less than  $\frac{1}{3}$  per cent. of the total number of farmers engaged in the growing of wheat in this State), and, of course, no action was taken on this petition in respect to a ballot, as the conditions of the Proclamation issued on the 28th April last had not been fulfilled.

The ballot of growers which was taken in the year 1924 resulted in over 88 per cent. of the votes recorded being in favour of the continuance of the pool, and the cost incurred in the conducting of a ballot (which has to be borne by the growers) is sufficient reason to dispose of a further ballot being taken, unless there is adequate evidence to indicate that the majority of the growers do not favour the continuance of the pool. No tangible evidence of this nature was forthcoming in connection with the opportunity recently afforded to secure a ballot being taken, and consequently the pool has been extended without a further ballot of the growers being taken on the matter.

### Stock Losses at Quilpie.

With reference to certain losses of stock at Quilpie, regarding which it was suggested the animals showed symptoms of poisoning, the Minister for Agriculture and Stock (Mr. W. Forgan Smith) instructed the Government Botanist (Mr. C. T. White) and Mr. E. J. Tannock, the Inspector of Stock at Charleville, to make urgent investigations.

A report has now been received from these officers that the trucking reserve and main stock route for some distance back from the reserve were inspected for the presence of plants likely to cause losses in stock.

On inquiry it was learnt that although there were only a few instances where losses were reported, the number of fatal cases in each instance was very large. In the latest case reported it was learnt that the cattle arrived on the reserve in very poor condition, and a considerable number were found dead on the following morning. This pointed either to hoven, due to eating succulent herbage, or to having eaten some plant containing a cyanogenetic glucoside. The latter theory was favoured.

The main stock route for about 28 miles from Quilpie was traversed, but was practically devoid of herbage and grass, and nothing could be found in sufficient quantity to cause trouble.

A number of poisonous or suspected plants were found on the trucking reserve, amongst others being the Bottle Tree Caustic, Caustic Creeper, and the Ellangowan Poison Bush. Along the stock route in wooded places, such as low hillsides, there is a quantity of Climbing Caustic, but there is some doubt about the properties of this plant, which, however, was not in sufficient quantity to cause trouble.

A number of plant specimens was obtained and handed to the Agricultural Chemist (Mr. J. C. Brännich) to test for prussic acid yielding glucosides. This examination revealed that of the plants from the Quilpie Reserve, only the Fuchsia Bush gave a strong positive test, and this bush, if eaten, would certainly be likely to cause the trouble. The poisonous principle in this plant varies from time to time, and occasionally the plant is almost free from it. The young succulent-growing parts seem to be the most active.

Of the plants collected on the stock route, the Western Rosewood gave a fairly strong positive test, but this tree is hardly in sufficient quantity to have a great effect.

The report of the officers indicates that there is no great danger to be apprehended, provided cattle are carefully driven and are in reasonable condition. Since the last loss several mobs of cattle have occupied the reserve and practically no losses among them have occurred.

**Peanut Board Election.**

Nominations for the election of four members to the Peanut Board closed at the Department of Agriculture and Stock on the 24th instant, with the following results:—

District No. 1 (Wienholt and Nanango Districts)—  
Charles Frederick Adermann, Wooroolin, and  
Malcolm Redman, Crawford.  
(Two representatives required.)

District No. 2 (the Central District)—  
Alfred Skinner Clark, Sandhills.

District No. 3 (the rest of Queensland)—  
Albert Charles Perske, Degilbo.

As only the required number have been nominated no election will be necessary, and steps will be taken for the appointment of the new members as from the 1st September next.

**Lowering Production Costs.**

The great problem facing the man on the land to-day is that of increasing his profits by lowering his production costs, for it is not likely that selling prices will show much increase or decrease. He cannot possibly consider increase of labour in order to increase production, for wages are payable all the time and profits come only at marketing time, and then depend almost wholly as to whether or not the weather has been kind. The only possible way then to reduce production costs is to find better methods of doing the work, and the use of modern machinery, with the addition of power where necessary, is the only way out of the problem. The Oliver Chilled Plough Works are pioneers in the manufacture of tillage equipment for tractor power builders. Oliver ploughs, harrows, cultivators and cane tools, all built for special use with the Fordson Power Unit, are admittedly among the most modern farm and station equipment obtainable. Among the Oliver lines are Oliver double side disc stump jump ploughs (with or without stump jump equipment); 1, 2, 3, and 4 furrow drawn type disc ploughs; 1, 2, 3, and 4 furrow mould-board ploughs; disc harrows; spring tooth harrows; tunc harrows; cultivators; and a complete line of horse-drawn ploughs, as well as everything required by the cane farmer in the way of implements. The Queensland distributors are Brisbane Cars and Tractors Limited, whilst the Townsville distributors are Northern Cars and Tractors Limited, Flinders street.

**Wheat Board Nominations.**

The following nominations have been received in connection with the annual election of five members to the State Wheat Board:—

- District No. 1 (Dalby-Maranoa)—  
Hoskin, Aaron, Mount View, via Jimbour;  
Swan, Robert, Wallumbilla.
- District No. 2 (Pittsworth District)—  
Fitzgerald, Edward, Felton;  
Krieg, Arthur Carl, Brookstead.
- District No. 3 (Warwick and Killarney)—  
Booth, Joseph James, Junabee;  
Braithwaite, Thomas, Warwick.  
Kirkegaard, Bergittinus Clemen Christian, Freestone.
- District No. 4 (Allora-Clifton)—  
Neale, William John Thomas, Allora.
- District No. 5 (Toowoomba and Lockyer)—  
Archibald, John, Oakley;  
Garvey, William, Gowrie Little Plain;  
McNee, Patrick, Kingsthorpe.

The election will be by postal ballot, and the counting of votes has been fixed for the 31st August.

### Engines Reduced in Price.

It will be good news to every man on the land to know that the Ruston-Hornaby petrol-kerosene engines have been greatly reduced in price. Seldom has such a quality engine been offered for such low cost. The prices of these engines are advertised elsewhere.

### Fruit Marketing—Sectional Group Committees.

Regulation 12 under the Fruit Marketing Acts has been revoked, and a further Regulation 12 issued providing for the nomination of candidates for election to Sectional Group Committees. In the case of the Banana Sectional Group Committee, a candidate for election must sign a statutory declaration to the effect that he does not act for or receive money from any agent or fruit merchant other than moneys received in payment for fruit consigned for sale and grown by such candidate.

### Spider Bites—a C.W.A. Member's Homely Remedy.

Through the Country Women's Association we have received the following contribution from Mrs. Bertha E. Phelps, president of the C.W.A. branch at Mungindi, concerning a remedy which she says she has never known to fail, and which has been used by her for over thirty years:—For bites by spiders, centipedes, scorpions, and other poisonous insects, make a hot bread poultice and then sprinkle thickly with good ipecacuanha powder. Apply this to the wound and repeat every hour if necessary. If treated at once, one poultice may suffice. I always give a small dose of Epsom salts to help to get rid of the poison out of the blood. I buy fresh ipecacuanha powder every year or so in order to have it strong.—“The Farmer and Settler.”

### Shall We all Fly?—Australia has most Privately-Owned Aeroplanes.

A vision of the day when every farm will have its own aeroplane landing-stage arises out of the latest figures of the Moth aeroplane output to countries throughout the world.

Australians own the largest number (34) of the 185 of these little machines delivered in twelve months. Thirty of them belong to private individuals in England.

All the Moths have folding wings; they can be wheeled and manœuvred by one man and housed in an ordinary garage. They can, moreover, descend on very limited space, while the cushioning effect of the Dunlop balloon tyres makes a smooth landing practicable almost anywhere.

The machines have a cruising speed of 75 to 80 miles an hour, and the remarkably small petrol consumption of 20 miles to the gallon. They can climb, at the rate of 625 feet per minute, to a height of 15,000 feet.

### Herd Testing—A Misunderstanding Removed.

The Minister for Agriculture and Stock, Mr. W. Forgan Smith, announced recently that representatives of the dairying industry had waited upon him and mentioned that it was understood that, from Press references to the effect that the Queensland Government had decided not to accept subsidy from the Commonwealth Government in connection with herd testing, and that it was the intention of the State Government to either discontinue or curtail herd testing operations.

The Minister advises that it is his desire to correct the erroneous impression which had arisen in the minds of dairy farmers, and he wishes to state definitely that herd testing operations will be continued, and every endeavour made to encourage dairy farmers to submit the highest possible number of cows to the test.

In the Dairy Bulletin, No. 2, which is published in this issue, a special appeal is made to dairy farmers to submit their herds for testing, and to take advantage of the facilities afforded by the Queensland Government to assist them in the important matter of increasing their milk and butter fat production. No legitimate application for the services of a herd tester to carry out the testing of any herd will meet with the refusal of the Department.

The Minister added that the subsidy from the Federal Government had applied only to two years' herd testing operation, and in this period £566 had been received from the Commonwealth Government by way of subsidy, and in the course of this period the expenditure in herd testing incurred by the State was slightly more than £4,400. It will be seen, therefore, that the Commonwealth contribution was small in comparison with the expenditure borne by the State, and in addition to this expenditure it must be recognised that the Better Bull Subsidy Scheme increases the monetary contributions that are made from State funds for herd improvement.

### **A Mackay Sanctuary.**

Camping Reserve No. 116, Cattle Creek, Mackay, has been declared a Sanctuary under the Animals and Birds Acts.

### **A Versatile Citrus Tree.**

About four years ago Mr. A. Woods, of Lorraine, Wilston, Brisbane, obtained a lemon tree from Coominya. The tree was immediately planted and first fruited in 1927. This year it fruited again with one half of the tree laden with Lisbon lemons and the other half with mandarins. Both classes of fruit were sound and well developed. The foliage in each case is true to type.

A paddock full of trees like that would, no doubt, solve many citrus grower's marketing worries.

### **Success of Queensland Dairy Factories.**

The Minister for Agriculture and Stock (Mr. W. Forgan Smith) informed the Press recently that it was pleasing to note the continued success of the Queensland dairy factories in dairy produce competitions. At the competitions held in Sydney in June it was noted that the Logan and Albert Co-operative Company and the Warwick Co-operative Dairy Company were successful in securing third position, while in the cheese section both awards went to Queensland, the Downs Co-operative Dairy Company at Lilydale and Koondaii being first and second respectively. It was gratifying, he said, to find that the products of this State were of such a high standard, and he congratulated the factory managements on their successes.

### **Gassing Tons of Mice.**

Recently, under the supervision of the manager of the State Wheat Board (Mr. W. Binns), poison gas was used to destroy the mice in the remaining portion of the wheat dump at Allora. The operation was most successful. After the gassing nineteen kerosene tins full of dead mice were gathered up, the number of rodents killed being estimated at 21,000. Not a mouse escaped from the dump, which is now almost removed, and the gassing operation must have prevented an intolerable plague in neighbouring houses that would have been caused by the mice from the demolished dump seeking further shelter. At the Clifton dump it is reported that a ton and a-quarter of mice had been destroyed in one day's gassing.

### **A Noxious Plant.**

The Minister for Agriculture and Stock (Mr. W. Forgan Smith) has informed us that, as a result of losses in stock that had occurred on a property at Zillmere, arrangements had been made for Mr. Francis, an officer attached to the Botanical Branch, to visit the property on which the losses of stock had occurred, and he reported that the probable cause of the trouble was the shrub *Cestrum Parqui*, a native of South America, but common as a stray from garden culture and in some places more or less of a weed. There seems to be no common name given to the plant, but it can be told by its brownish-green or yellowish-green flowers borne in bunches which are followed by black berries. Suburban poultry and dairy farmers who may have the plant growing in their properties are advised to destroy it.

### **Queensland Products—Appreciation of Southern Visitor.**

With the object of securing first-hand information of the conditions prevailing in this State, Mr. T. H. Arrowsmith (general manager in Australia of the H. J. Heinz Company) has made a thorough investigation of Queensland. Confessing his amazement at the marked development of the country, in the course of an interview, Mr. Arrowsmith said that Queensland was very fortunate in its possibilities, and the greatest success attained by any country was where there were outstanding possibilities for primary production, principally foodstuffs. Another advantage which Queensland possessed was in natural outlets to the sea at frequent intervals, and natural geographical centres for handling raw products. The type of men and women in Queensland were of the best Anglo-Saxon—of fine physique and keen intelligence, and they took a marked interest in what was going on around them.

Referring to foodstuffs, Mr. Arrowsmith said that the Spanish white variety of peanut was the best nut for manufacturing purposes, on account of the oil content and other values. From what he had seen of the tomatoes grown in the district, they were more of the home-grown variety and not the large heart-shape type, which was the best kind for food. The quality of land on the coast and the class of climate was certainly invaluable for growing almost any kind of food.

### Committee of Direction of Fruit Marketing.

The Regulations dealing with the election of Sectional Group Committees under "*The Fruit Marketing Organisation Acts, 1923 to 1925*," have been revoked, and new Regulations 73, 74, 75, 76, and 77 have been approved under those Acts, providing for the election of Banana, Pineapple, Citrus, Deciduous, and Other Fruits Sectional Group Committees.

### Age and Youth.

"Always, as long as I can remember, there has been a dispute and invidious comparisons between the old and the young. The young find the old prey upon and restrain them, and the old find the young shallow, disappointing, and aimless in vivid contrast to their own revised memories of their own early days. The present time is one in which these perennial accusations flower with exceptional vigour. But there does seem to be some truth in the statement that the facilities to live frivolously are greater now than they have ever been for old and young folk alike. In the great communities that emerge from Christendom there is a widespread disposition to regard Sunday as merely a holiday. But that was certainly not the original intention of Sunday. It was a day dedicated to the greater issues of life. Now great multitudes of people do not even pretend to set aside any time at all to the greater issues of life. The churches are neglected, and nothing of a unifying or exalting sort takes their place."—H. G. Wells.

### The Public Curator's Office.

Time—a period of twelve years—has proved the belief of the people of Queensland that the Public Curator Office, created for their needs, has more than justified its existence.

The profits earned by the Office since its inception on the 1st January, 1916, have been such that the costs and charges of administration have been reduced from time to time, making it now the most liberal Public Trust Office in Australia.

Not only have the costs and charges been reduced to a minimum, but the shares held on behalf of infant beneficiaries until they attain their majority are increased by the addition of interest at the rate of 5 per cent. per annum. This is a gilt-edged investment for infants, because the Office of the Public Curator is under the guarantee of the State, and when a child attains twenty-one years of age its share, with compound interest added, is payable immediately. There is no question of misappropriation which often happens when private persons are appointed Executor and Trustee.

Furthermore, the Public Curator Act provides for the maintenance and education of children out of their shares without the necessity of making an expensive application to the court for leave to do so. This matter is in the discretion of the Public Curator, who is at present helping hundreds of parents to maintain their children out of the shares to which they are entitled in the estate of a father, mother, or other relative.

In order to make manifest, in a practical way, their confidence in the Trust Office of the Public Curator, over 20,000 persons have made their wills appointing the Public Curator their Executor and Trustee. As Dave would say, "He's awright." Why? Because the Public Curator acts without fear or favour. He is under no obligation to friends, relatives, or political parties, but carries out his duties fearlessly and impartially as the law provides that he should, and he charges only what fees and costs that the law has fixed, neither more nor less.

As the Office of the Public Curator is a corporation, it never dies. This means that men may come, and men may go, but the Public Curator as Executor and Trustee still goes on, thereby assuring continuity of administration which is a very important matter.

Moreover, the Office is so organised as to ensure promptitude with efficiency and safety in the despatch of business throughout Queensland. The policy of the Office provides for the widest possible measure of decentralisation consistent with safety. Necessarily, the most important administrative work has to be centred in the Head Office at Brisbane; but the Branch Offices at Rockhampton, Townsville, and Cairns are as self-contained as possible, thus facilitating the work throughout this great State and saving time. These Branch or District Offices have full power to conduct the administration of estates in their respective districts, and are in charge of reliable and responsible officers with efficient staffs skilled in all phases of estate administration.

### Castor Oil Plant Leaves.

How many people in the country know that the castor oil plant leaf makes one of the best poultices in the world? The Indians in South America use it as a sovereign remedy for tumours, boils, and abscesses. Steeped in tepid water with a few drops of lysol, the leaves are said to be a sure cure. It is good also to relieve pain in the stomach. When the writer was in Queensland some years ago on a visit to a station, the manager was found lying in agony with abdominal pains, patiently awaiting the arrival of the doctor. Knowing of this remedy the writer made a large poultice and applied it, with almost immediate relief. The leaves are used largely in treating wounds in horses in South America.—“The Pastoral Review.”

### Co-operation—What it Means.

The London Co-operative Society has issued another edition of the useful pamphlet by Mr. R. C. Morrison, M.P., entitled “The Commonsense of Co-operation.” This edition has a “foreword,” written by Mr. Ramsay MacDonald, who says—

“Every worker should belong to the Co-operative Movement. Mr. Morrison shows that co-operation is the movement by which the workers do without the middleman and supply for themselves goods that are honest, whilst keeping in their own pockets profits that would otherwise go to make other people rich. Mr. Morrison’s arguments are forceful and convincing, and the pamphlet merits a big circulation.”

### What Dairying means to Australia.

Here are some illuminating Federal figures, compiled officially:—

Dairy farms represent a capital of £125,000,000.

Annual production, £45,000,000, of which £30,000,000 is for milk products.

Capital outlay of dairy factories, £4,250,000.

Dairy factory production, £23,000,000 per annum.

Two thirds of the production is consumed locally, and one-third exported.

On dairy farms 143,785 people are employed.

In dairy factories 5,826 people are employed.

The dependents of those employed in the dairying industry number 500,000.

Directly and indirectly, at least 1,000,000 people in Australia, or one-sixth of our total population, are dependent upon the dairying industry.

### Mammitis.

The Minister for Agriculture and Stock (Mr. W. Forgan Smith) has announced that numerous inquiries had been received by the Department from dairy farmers relative to the efficacy of vaccine as a preventive or curative agent for infectious mammitis. He had referred the inquiries upon this matter to the Chief Veterinary Officer of the Department, Major A. H. Cory, M.R.C.V.S., and he has submitted the following informative particulars concerning this disease:—

For several years past it has been recognised that the best treatment for this disease is the use of a vaccine. The vaccine usually contains two organisms—viz., *Staphylococci* and *Streptococci*, two common pus organisms, but the vaccine is made from various strains of these organisms. A vaccine is prepared and kept in stock at the Stock Experiment Station, Yeerongpilly, as also are other proprietary stock vaccines on the market. It appears useless to inoculate against this disease until animals are affected. The use of the vaccine in our present stage of knowledge, appears more as a curative than a preventive, and even then the ordinary stock vaccine in many cases is useless, an autogenous vaccine (one prepared from the individual animal) being necessary to bring about the desired result.

Proprietary vaccines on the market have been bacteriologically examined by this Department, and found to be sterile preparations, consequently they can do no harm, and the operation is so simple that any person of ordinary intelligence can carry it out. Thousands of dairy herds will never be affected with this disease, consequently vaccination is useless. If they should be treated the vaccine will be wrongly credited as being a preventive.

Inquiries have been made from other countries and the various States of the Commonwealth, but it is not recognised that the stock vaccines on the market are of any scientific value as preventives.

One Australian journal sums up the use of proprietary preparations as follows:—“In the meantime farmers will be well advised to exercise great caution in accepting interested statements and spending money on the vaccination of their cows. There is great risk in resting under a false sense of security, and thereby neglecting ordinary preventive measures.”

### Great Ideals.

"The great ideals of the old world indissolubly linked with the primitive record of Christianity, are preserved for us in letters of gold, in language that escapes all change; they stand behind and beyond our local habits, and our local forms of creed. To them all the peoples of the civilised world look back; and by them the nations of the future may be inspired and brought nearer to each other. Let us not think lightly, then, of the old high road which the course of European education still leaves open before every new age. Let us see to it that our successors may have the privilege that has been given to us, of hearing the great voices of that older time speak in their own accents across the silent years, of being quickened by them to know the gold from the dross, of learning from them what is simple, what is high, what is human, what is true.

"Captains and conquerors leave a little dust,  
And kings a dubious legend of their reign;  
The swords of Cæsar, they are less than rust:  
The poet doth remain."

—Professor Conway.

### Glass-Lined Tanks for Milk Carriage.

Anything that can be done to minimise the handling of milk is welcomed. Progress is being made in this direction in England, and it is now announced that by means of the new glass-lined tanks for rail transportation introduced by Wilts United Dairies, in conjunction with the London, Midland, and Southern and the Great Western Railways, milk will be brought from the creamery in Wiltshire to the combine's depôt in London without it once being seen, let alone touched, until it is safely bottled, at the rate of 21,000 an hour, after pasteurisation.

The railways have introduced special facilities in the past for dealing with the milk traffic. "Milk only" trains are run, and sidings, vans, and docks have been built. Now the tanks have arrived.

These tanks are constructed of steel and lined throughout with glass enamel, which is unaffected by the action of milk, and harmless to the milk itself. Glass is the easiest material in the world to keep clean and sterile.

The service marks the greatest advance in the rail transport of milk ever introduced into the country. Over 280,000,000 gallons of milk are conveyed annually by British railways, and a train 2,333 miles long would be required to haul this amount under the churn system. Where the tanks are used, churns are entirely done away with, and the train in this case would measure only 689 miles, a saving of 70 per cent. A like percentage is saved in dead-weight haulage. On three vanloads of churns this is 80 tons, and on one tank, which conveys the same quantity of milk, 22 tons. One tank holding 3,000 gallons of milk has a much smaller bulk than 300 churns, each holding ten gallons.

Not the least important factor about the tank method is the cool and even temperature at which it is possible to transport milk. This is maintained with never more than an increase of one degree on the hottest day by means of cork and steel insulation at 38 degrees, at which temperature bacterial growth is impossible. The insulation consists of a 2-inch thickness of cork, protected by thin steel.

On arrival at Willesden the milk is unloaded from the tanks at the rate of 150 gallons a minute. This is accomplished by means of compressed air, all of which is filtered.

Special attention has been given to the design of the fittings on the tanks, so that they may be easily dismantled for sterilisation. With the old method, every churn and its lid were thoroughly washed and sterilised at the end of every journey, and this involved loss of time, labour, and expense. The tanks can be simply and thoroughly cleaned by one man. The fittings include, beside one milk inlet and two milk outlets, a steam or air inlet and a manhole to facilitate inspection.

The first cleansing process consists of rinsing with cold water, after which the glass surface of the tanks is thoroughly scrubbed. This is where the man clammers in. Rinsing with hot water follows, and finally comes sterilisation with steam at a pressure of 30 lb. to the square inch. Should the pressure exceed that figure there is a safety valve.

As with the churns, cleansing and sterilisation are done at the end of every journey.

# The Home and the Garden.

## OUR BABIES.

(From Notes issued by the Queensland Baby Clinics.)

Under this heading it is proposed to issue a series of short articles dealing with the welfare and care of babies, in the hope of increasing their health and happiness and decreasing the number of unnecessary deaths among them.

### Four Important Points.

When a mother thinks of weaning her baby there are four points which she should take into consideration—

- (1) The age of the child;
- (2) The time of the year;
- (3) The time required for weaning;
- (4) The method of doing it.

### The Age of the Child.

The best time to wean baby is between the age of nine and twelve months. Up to that time his sole food should have been his mother's milk and, unless for urgent reasons, baby should never be weaned before that. The younger the baby is the greater are the risks that attend the process. Thus, a baby four or five months old is much more likely to become upset or ill if weaned than one eight or nine months. If baby is less than nine months old when weaned, he should be given a feeding bottle, but if over that age it is better to teach him to drink out of a cup or to use a spoon. If baby has been bottle-fed, when weaning time comes give him his food out of a cup instead of the bottle at first for one feed only during the day, so accustoming him to the change. Then later give the cup for two feeds and the bottle for the remainder of the day, and so on.

Some mothers think that if they give a bottle feed instead of a breast feed in baby's early months, they will, in this way, make weaning easier. This should not be done. What they almost always achieve is the unnecessary early weaning of the child, for by substituting a bottle feed for a breast feed the mother's milk will diminish. Drinks of boiled water may be given to a young baby from a bottle, but a full feed should not be given while baby is on the breast.

The second point is the time of year. Always, if possible, avoid weaning in very hot weather. This is sometimes difficult, because Queensland has a long summer. If baby must be weaned during hot weather avoid the worst months. Here the worst months are probably not the hottest, but those during which dysentery or summer diarrhoea (gastro-enteritis, as it is often called) is prevalent. Every summer this disease appears and makes many babies ill. It appears early in summer and is at its worst in November and December. For this reason these are the most dangerous months for weaning baby. If he reaches nine months during this time, postpone weaning at least until January, and then go very slowly and carefully.

Babies kept wholly on the breast until about fifteen or sixteen months old—i.e., until the cooler weather comes, are often very difficult to wean. Not infrequently they refuse absolutely to take other foods. The older the baby the more difficult he is to wean.

The third point is the time required for weaning. Unless absolutely unavoidable the change from natural to artificial feeding should never be sudden. The mother who quite suddenly substitutes the one for the other doubtless does it with good intention, but it is an unkindness to the baby. The change from complete natural feeding to complete artificial feeding should never be made in less than two weeks; preferably take five or six weeks.

### A Practical Plan.

The following is a practical plan for weaning after nine months. We will assume that the baby has been fed four-hourly—i.e., at 6 and 10 a.m., and 2, 6, and 10 p.m., so getting five feeds daily.

**First Change.**—Give baby oat or barley jelly by spoon at the 10 o'clock feed. Begin with 1 tablespoon of the jelly and give 2 or 3 teaspoons of cow's milk on it. Follow this by the usual breast feed and give breast feeds as usual for the remainder of the day. Do this daily for a week and make no other change during that time.

A crisp crust may be given once or twice daily before feeds throughout the weaning period. Give it to him when he is hungry. About ten minutes before his feed is due, not between feeds.

**Second Change.**—Omit breast feeding at 10 a.m. Give instead first the oat or barley jelly, which may be gradually increased to 2 or 3 tablespoons, and follow this by about 6 to 8 oz.—about an ordinary cupful—of milk mixture. Make no further change during this second week. Pure milk should not be given to begin with; it is better to commence with about 3 parts milk to 1 of water and gradually increase to full strength.

**Third Change.**—Give the breast every eight hours—i.e., at 6 a.m., 2 p.m., and 10 p.m. Give oat or barley jelly at 10 a.m. and 6 p.m., followed by the milk, as in change 2. Do this daily and make no further change this third week.

**Fourth Change and for the Fourth Week.**—Give the breast at 6 in the morning and 6 at night. At the other three feeds give the milk mixture. Give oat or barley jelly at 10 a.m. before bottle, and at 6 p.m. before breast.

**Fifth Change and for the Fifth Week.**—Give the breast once only—i.e., at the 6 a.m. feed. Give milk mixture for all other feeds. Oat or barley jelly before 10 a.m. and 6 p.m. feeds.

**Sixth Change and for the Sixth Week.**—Discontinue giving breast at 6 a.m. Give milk only.

Baby is now entirely weaned, and it is probable that it has been achieved without his realising that any change was being made.

### **When Life Habits are Formed.**

After weaning is completed, care is still required to establish the baby on suitable food. He should certainly not be allowed to share the family meals, and eat scraps of everything. Remember that at this stage food tastes and habits are formed which may last a lifetime. The following important points should be remembered by the mother:—

1. Teach baby to drink out of a cup at any time between nine and twelve months (if this has not already been done, and provided he has cut two teeth) and discontinue bottle feeding. Give the drinks from a cup, first at one feed (say, the 10 a.m.) then at two feeds in the day, and so on, thus discontinuing bottle feeding gradually.

2. Keep absolutely to regular meal times. Give nothing whatever but water and fruit juice between meals.

3. As baby takes more solid and varied food he needs less milk, but do not let him go without a drink at each meal. A healthy baby at this age can usually take pure cow's milk. Up to eighteen months milk in some form should be his principal food.

4. Introduce all new foods one at a time and a little at a time. Never make sudden changes. It is better to go too slowly than too quickly.

5. Teach baby to eat each new food that is good for him. Do not let him start the bad habit of refusing food because he does not like it. If persevered with, babies like almost anything that is good for them. They will not want the things which are bad for them if they have never tasted them. Do not let them get the taste for cake or sweets.

6. Active exercise for teeth, jaws, and salivary glands is absolutely necessary. Baby must be taught to chew, not to bolt his food, and, as times goes on, to take more and more of his food in hard form. Remember that toast or crusts, with butter or dripping and a drink of milk are just as nourishing and better for teeth and digestion than a basin of bread and milk.

7. Do not add too much sugar to baby's food. It is bad for the teeth and the digestion.

8. Cook all foods thoroughly and serve appetisingly. Add a little salt in cooking.

9. Children should not be continually urged to eat if they are disinclined to do so. Under no ordinary circumstances should a child be forced to eat.

10. If there is any important article of a simple diet, such as milk, meat, cereals, or vegetables, which a child habitually refuses, this should always be given first at the meal, and all other food withheld until this is eaten.

11. Always give the most substantial meal in the middle of the day. Never give a young child a meal of meat and vegetables before he goes to bed at night.

### Suitable Foods.

The following foods may be given to baby between the the end of weaning and twelve months:—More cereal jelly, slowly increasing up to 10 oz. daily. More crisp crust and toast; more fruit juice.

From twelve to fifteen months a considerable increase may be made in the diet, always remembering to give new foods one at a time and a little at a time.

Give more solid, dry, and hard foods, such as crusts, baked bread, and toast, all to be taken with a little butter or dripping. Sweet biscuits should not be given. They are made from finely ground flour, which form a paste which lodges in the crevices of the teeth, where it is liable to set up fermentation and decay. Cereal jellies to be continued; towards the end of the time gradually mix some unstrained porridge into the jelly, and as time goes on less and less need be strained. Give milk puddings made with well cooked ground rice or semolina. At this time a little egg may be given—perhaps half a yolk two or three times a week. Gradually introduce a little white. Give vegetable milk-broth, chicken broth, or mutton broth; all to be made with pearl barley or rice and to be well strained.

Of Vegetables.—Floury potato cooked in skin, spinach, cauliflower, carrot, &c., well cooked, rubbed through a fine sieve and served warm with a little butter or meat gravy without fat.

Fruits.—Pulp of baked apple or pulp of stewed prunes. Begin with only a teaspoonful and increase very gradually to 1 or 2 tablespoons. A little milk may be given with this. Gradually and cautiously some raw ripe apple may be given.

From fifteen to eighteen months, feed on same lines as for previous three months, but give more solid, hard foods, including wholemeal bread and milk puddings made with rice, sago, &c. Give a piece of raw ripe apple at the end of each meal. Continue training baby to chew thoroughly and avoid giving much soft, mushy food. An egg lightly boiled may be given, but not more than three times a week. Light fish, steamed or boiled, may be given; also chicken, steamed or boiled and either well minced or preferably chewed off the bone. Only a teaspoonful of either fish or chicken should be allowed at first, and the quantity very slowly increased.

An important point for the mother to remember during this period is that, though baby's first teeth are only now being cut, the second set of permanent teeth are forming in the gums. Their strength and durability depend very largely on the foods given and the amount of work done by mouth and jaws at this time.

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## THE WOMAN ON THE FARM.

By A. H.\*

When considering the amount that is written on labour-saving devices and the home life on a farm generally, one wonders why the farm home is still in such a primitive state.

There is no doubt that the farmer's wife is a very conservative being. She will read about wonderful labour savers, and occasionally go to meetings and hear discussions on improving the home, but she will go steadily on in her old way. I wonder how many women owe their ill-health to the washtub.

### Wash Day in Winter.

Consider a farm woman's wash day in the winter. After the usual work of getting breakfast, washing dishes, getting the children off to school, tidying up the house, &c., she will start her washing.

She will turn a washing machine for an hour or more, put the wet clothes through a wringer which also has to be turned by hand, change the water for rinsing, put the clothes through the wringer again, then carry a heavy basket of wet clothes outside and put them on the line, though she knows they won't dry, only freeze. It will improve the colour of the clothes, so she struggles with frozen sheets and pegs that slip out of her hands because they are so cold.

Surely that is enough work for one little woman; but no, her day is barely started. The washing machine has to be emptied and put away, the floor washed and the place tidied up, dinner to get and wash up, then the clothes have to be brought in and hung up somewhere where they will dry.

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\* In the "Western Producer" (W.A.).

### **Farm Woman is Conservative.**

There is a saying that work never kills one, if it did the farm woman would very soon be extinct. Let anyone suggest to the farm woman that she send her washing to the laundry, she will immediately give many reasons why she could not do that. "They make the clothes such a bad colour," or "they tear the clothes so." Surely her health and looks are more important than sheets and towels.

I think the farm papers could help more than they do. Pick up any farm paper and open at the woman's page. What does it chiefly write about? "How to can vegetables," "How to put down meat," "How to make rag mats in one's spare time." How to make innumerable things which mean never ending work. I would like to see a page given over occasionally to telling farm women how to sit and do nothing.

### **Pleasure is Great Part Work.**

Even her pleasures are a great part work. If it is a community affair she generally has to take some cooking with her; if it is a private visit, she will probably enjoy a very good meal, and then spend most of the rest of her visit in helping wash the dishes.

A farm home life can be a very happy cosy affair, but very often it is just the opposite, and the blame is greatly due to the woman. There is too much of the idea that because one is on a farm everything must be made on the farm, and the labour-savers of the city are not used enough.

### **Learn to Live.**

I would like to impress upon the farm woman not to look askance at the woman who sends her washing to the laundry, who sometimes buys bread, and who, instead of spending lovely summer days over a hot stove canning fruit and vegetables, buys the stuff from the store, and goes out and enjoys the fresh air and sunshine, and feels and is a better woman for it.

---

## **KITCHEN GARDEN.**

Now is the time when the kitchen garden will richly repay all the labour bestowed upon it, for it is the month for sowing many kinds of vegetables. If the soil is not naturally rich, make it so by a liberal application of stable manure and compost. Manure for the garden during summer should be in the liquid form for preference. Failing a sufficient supply of this, artificials may be used with good results. Dig or plough the ground deeply, and afterwards keep the surface in good tilth about the crops. Water early in the morning or late in the evening, and in the latter case stir the soil early next day to prevent caking. Mulching with straw, leaves, or litter will be of great benefit as the season becomes hotter. It is a good thing to apply a little salt to newly-dug beds. What the action of salt is is not exactly known, but when it is applied as a top dressing it tends to check rank growth. A little is excellent for cabbages, and especially for asparagus, but too much renders the soil sterile and causes hardpan to form. French or kidney beans may now be sown in all parts of the State. The Lima bean delights in the hottest weather. Sow the dwarf kinds in drills 3 ft. apart and 18 in. between the plants, and the climbing sorts 6 ft. each way. Sow Guada beans, providing a trellis for it to climb on later. Sow cucumbers, melons, marrows, and squash at once. If they are troubled by the red beetle, spray with Paris green or London purple. In cool districts peas and even some beetroot may be sown. Set out egg plants in rows 4 ft. apart. Plant out tomatoes 3½ ft. each way, and train them to a single stem, either on stakes, trellis, or wire netting. Plant out rosellas. Sow mustard and cress, spinnach, lettuce, vegetable marrows, custard marrows, parsnips, carrots, chicory, eschalots, cabbage, radishes, kohl-rabi, &c. These will all prove satisfactory provided the ground is well worked, kept clean, and that water, manure, and, where required, shade are provided.

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### **FIVE REASONS IN FAVOUR OF THE HOME VEGETABLE GARDEN.**

(1). Fresh vegetables, especially vegetables containing vitamins, are essential to good, robust health, and medical men are now advising people to "eat more vegetables."

(2) The growing of vegetables not only means a saving of money, but educates the children by inculcating a desire to have their own gardens in later life, and so help to keep down the costs of living.

(3) Vegetable-growing is not only a healthy occupation, but it also provides exercise and recreation. In the suburbs it has a tendency to keep young people contented at home, and to trouble less about going to horse races and places of gambling. With country people who, perhaps, are less in need of exercise, gardening is a delightful hobby.

(4) It enables private gardeners to improve the strains of vegetables by a careful selection of seed, much in the same way that a flockmaster improves his sheep; and much satisfaction, and not unusually generous reward are to be gained from this work.

(5) The home garden enables the testing out, in a small way, of the newer varieties of vegetables, which work is not always possible, or, if it is possible, not payable with the professional or commercial gardener. The amateur gardener will find this work both fascinating and health-giving.

## Farm Notes for September.

With the advent of spring, cultivating implements play an important part in farming operations.

The increased warmth of soil and atmosphere is conducive to the growth of weeds of all kinds, particularly on those soils that have only received an indifferent preparation.

Potatoes planted during last month will have made their appearance above the soil, and where doubt exists as to their freedom from blight they should be sprayed with either Burgundy or Bordeaux mixture as soon as the young leaves are clear of the soil surface.

Land which has received careful initial cultivation and has a sufficiency of sub-surface moisture to permit of a satisfactory germination of seeds may be sown with maize, millets, panicum, sorghums, melons, pumpkins, cowpeas, broom millets, and crops of a like nature provided, of course, that the areas sown are not usually subjected to late frosts.

Rhodes grass may be sown now over well-prepared surfaces of recently cleared forest lands or where early scrub burns have been obtained, and the seed is sown subsequent to showers. More rapid growths, however, are usually obtainable on areas dealt with, say, a month later.

In connection with the sowing of Rhodes grass, farmers are reminded that they have the Pure Seeds Act for their protection, and in Rhodes grass, perhaps more than any other grass, it is necessary that seed of good germination only should be sown. A sample forwarded to the Department of Agriculture will elicit the information free of cost as to whether it is worth sowing or not.

Where the conditions of rainfall are suited to its growth, paspalum may be sown this month.

The spring maize crop, always a risky one, requires to be sown on land which has received good initial cultivation and has reserves of soil moisture. Check-row seeding in this crop is to be recommended, permitting as it does right-angled or diagonal cultivation by horse implements, minimising the amount of weed growth, and at the same time obtaining a soil mulch that will, with the aid of light showers, assist to tide the plant over its critical period of "tasselling."

Although cotton may be sown this month, it usually stands a better chance if deferred until October. The harvesting of cotton during the normal rainy season is, if possible, to be avoided.

The sowing of intermediate crops prior to the preparation of land for lucerne sowing should be carried out in order that early and thorough cultivation can take place prior to the autumn sowing.

The following subsidiary crops may be sown during the month:—Tobacco and peanuts; plant sweet potatoes, arrowroot, sugar-cane, and cow'ene (preferably the 90-stalked variety), and in those districts suited to their production yams and ginger. Plant out coffee.

## Orchard Notes for September.

### THE COASTAL DISTRICTS.

September is a busy month for the fruitgrowers in the coastal districts of this State, as the returns to be obtained from the orchards, vineyards, and plantations depend very largely on the trees, vines, and other fruits getting a good start now.

In the case of citrus orchards—especially in the southern half of the State—it is certainly the most important month in the year, as the crop of fruit to be harvested during the following autumn and winter depends not only on the trees blossoming well but, what is of much more importance, that the blossoms mature properly and set a good crop of fruit.

This can only be brought about by keeping the trees healthy and in vigorous growth, as, if the trees are not in this condition, they do not possess the necessary strength to set their fruit, even though they may blossom profusely. The maintenance of the trees in a state of vigorous growth demands—first, that there is an adequate supply of moisture in the soil for the requirements of the tree; and, secondly, that there is an adequate supply of the essential plant-foods available in the soil.

With respect to the supply of moisture in the soil, this can only be secured by deep and systematic cultivation, except in seasons of good rainfall or where there is a supply of water for irrigation. As a rule, September is a more or less dry month, and when it is dry there is little chance of securing a good crop of fruit from a neglected orchard.

If the advice that was given in the Notes for August regarding the conservation of moisture in the soil has been carried out, all that is necessary is to keep the soil stirred frequently, so as to prevent the loss of moisture by surface evaporation. If the advice has been ignored, then no time should be lost, but the soil should be brought into a state of good tilth as quickly as possible.

Where there is a supply of water available for irrigation, the trees should receive a thorough soaking if they require it. Don't wait till the trees show signs of distress, but see that they are supplied with an adequate supply of moisture during the flowering and setting periods.

It is probable that one of the chief causes why navel oranges are frequently shy bearers in the coastal districts is that the trees, though they produce a heavy crop of blossoms, are unable to set their fruit, owing to a lack of sufficient moisture in the soil at that time, as during seasons when there is a good rainfall and the trees are in vigorous growth, or where they are grown by irrigation, as a rule they bear much better crops. The importance of maintaining a good supply of moisture in the soil is thus recognised in the case of this particular variety of citrus fruit.

When the trees show the want of sufficient plant-food—a condition that is easily known by the colour of the foliage and their weakly growth—the orchard should be manured with a quick-acting, complete manure, such as a mixture of superphosphate, sulphate of ammonia, and sulphate of potash, the plant-foods which are soluble in the water contained in the soil and are thus readily taken up by the feeding roots.

Although the above has been written mainly in respect to citrus orchards, it applies equally well to those in which other fruit trees are grown. Where the land has been prepared for bananas, planting should take place during the month. If the plantation is to be made on old land, then the soil should have been deeply ploughed and subsoiled and brought into a state of perfect tilth prior to planting. It should also receive a good dressing of a complete manure, so as to provide an ample supply of available plant-food. In the case of new land, which has, as a rule, been scrub that has been recently fallen and burnt off, the first operation is to dig the holes for the suckers at about 12 ft. apart each way. Good holes should be dug, and they should be deep enough to permit the top of the bulb or corm of the sucker to be 6 in. below the surface of the ground.

Take great care in the selection of the suckers, and see that they are free from beetle borers or other diseases.

As a precaution it is advisable to cut off all old roots and to dip the corms for two hours in a solution of corrosive sublimate, made by dissolving 1 oz. of this substance in 6 gallons of water.

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In old banana plantations keep the ground well worked and free from weeds and remove all superfluous suckers.

When necessary manure—using a complete fertiliser rich in potash, nitrogen, and phosphoric acid, such as a mixture of meatworks manure and sulphate of potash—1 of the former to 1 of the latter.

Pineapples can also be planted now. The ground should be thoroughly prepared—viz., brought into a state of perfect tilth to a depth of at least 1 ft., more if possible—not scratched, as frequently happens; and when the soil requires feeding, it should be manured with a complete manure, which should, however, contain no superphosphate.

Old plantations should be kept in a good state of tilth and be manured with a complete fertiliser in which the phosphoric acid is in the form of bones, basic phosphate, or finely ground phosphatic rock, but on no account as superphosphate.

The pruning of custard apples should be carried out during the month, leaving the work, however, as late in the season as possible, as it is not advisable to encourage an early growth, which often means a production of infertile flowers. If the weather conditions are favourable passion vines can also be pruned now, as if cut back hard they will make new growth that will bear an autumn crop of fruit instead of one ripening during the summer.

Grape vines will require careful attention from the time the buds start, and they should be regularly and systematically sprayed with Bordeaux mixture from then till the time the fruit is ready to colour, in order to prevent loss by downy mildew or anthracnose.

Where leaf-eating beetles, caterpillars, or other insects are present, the trees or plants on which they are feeding should be sprayed with arsenate of lead. All fruit-fly infested fruit must be gathered and destroyed and on no account be allowed to lie about on the ground, as, if the fly is allowed to breed unchecked at this time of the year, there is very little chance of keeping it in check later in the season.

## THE GRANITE BELT, SOUTHERN AND CENTRAL TABLELANDS.

Where not already completed, the winter spraying with lime-sulphur should be finished as early in the month as possible. Black aphid should be fought wherever it makes its appearance by spraying with a tobacco wash, such as black-leaf forty, as if these very destructive insects are kept well in hand the young growth of flowers, leaves, wood, and fruit will have a chance to develop. Woolly aphid should also be systematically fought wherever present, as once the trees are in leaf it is much more difficult to treat.

The working over of undesirable varieties of fruit trees can be continued. The pruning of grape vines should be done during the month, delaying the work as long as it is safe to do so, as the later the vines are pruned the less chance there is of their young growth being killed by late frosts. Keep the orchards well worked and free from weeds of all kinds, as the latter not only deplete the soil of moisture but also act as a harbour for many serious pests, such as the Rutherglen bug.

Grape vines should be swabbed with the sulphuric acid solution, mentioned in the Notes for August, when the buds begin to swell and just before they burst, as a protection against black spot and downy mildew.

New vineyards can be set out, and, in order to destroy any fungus spores that may be attached to the cuttings, it is a good plan to dip them in Bordeaux mixture before planting. The land for vines should be well and deeply worked, and the cutting should be planted with one eye only out of the ground and one eye at or near the surface of the ground.

In the warmer parts which are suitable for the growth of citrus fruits, the land must be kept well cultivated, and if the trees need irrigating they should be given a good soaking, to be followed by cultivation as soon as the land will carry a horse without packing.

In these parts fruit fly should be systematically fought, as it will probably make its appearance in late citrus fruits and loquats; and if this crop of flies is destroyed, there will be every chance of the early crops of plums, peaches, and apricots escaping without much loss.

**ASTRONOMICAL DATA FOR QUEENSLAND.**

TIMES COMPUTED BY D. EGLINTON, F.R.A.S., AND A. C. EGLINTON.

**TIMES OF SUNRISE, SUNSET, AND MOONRISE.****AT WARWICK.**

Date.	August, 1928.		September, 1928.		MOONRISE.	
	Rises.	Sets.	Rises.	Sets.	Rises.	Sets.
1	6.35	5.21	6.7	5.36	p.m.	p.m.
2	6.34	5.22	6.6	5.37	4.50	6.45
3	6.34	5.22	6.5	5.37	5.50	7.46
4	6.33	5.23	6.4	5.38	6.52	8.49
5	6.33	5.23	6.2	5.38	7.53	9.54
6	6.32	5.23	6.1	5.39	8.55	10.59
7	6.31	5.24	6.0	5.40	9.55	a.m.
8	6.31	5.24	5.59	5.40	10.57	12.8
9	6.30	5.24	5.58	5.41	11.59	1.24
10	6.29	5.25	5.57	5.41	...	2.26
11	6.28	5.26	5.56	5.42	a.m.	...
12	6.27	5.27	5.54	5.43	1.7	3.24
13	6.26	5.28	5.53	5.43	2.15	4.6
14	6.25	5.29	5.52	5.44	3.19	4.47
15	6.25	5.29	5.51	5.44	4.22	5.29
16	6.24	5.30	5.50	5.45	5.20	6.3
17	6.23	5.30	5.48	5.45	6.12	6.35
18	6.22	5.31	5.47	5.46	7.5	7.5
19	6.21	5.31	5.46	5.46	7.35	7.35
20	6.21	5.31	5.45	5.46	8.5	8.5
21	6.20	5.32	5.44	5.47	8.36	8.39
22	6.20	5.32	5.43	5.47	9.6	9.14
23	6.19	5.32	5.42	5.47	9.37	9.54
24	6.18	5.32	5.41	5.47	10.10	10.40
25	6.16	5.33	5.40	5.48	10.42	11.30
26	6.14	5.33	5.38	5.48	11.19	12.23
27	6.13	5.34	5.37	5.48	noon	p.m.
28	6.11	5.34	5.36	5.49	12.0	1.20
29	6.10	5.35	5.35	5.49	p.m.	...
30	6.9	5.35	5.34	5.50	12.49	2.23
31	6.7	5.36	...	...	1.42	3.25
					2.38	4.28
					3.38	5.30
					4.40	6.35
					5.43	...

**Phases of the Moon, Occultations, &c.**

The times stated are for Queensland, New South Wales, Victoria, and Tasmania.

2 Aug.	○ Full Moon	1 30 a.m.
9 "	☾ Last Quarter	3 24 a.m.
15 "	● New Moon	11 49 p.m.
23 "	☾ First Quarter	6 21 p.m.
31 "	○ Full Moon	12 34 p.m.

Perigee, 11th August, at 2.54 a.m.  
Apogee, 23rd August, at 4.42 a.m.

The apparent conjunction of Venus and Neptune on the 10th, at 1 p.m., will only be of interest on account of the enormous distance, 2,724 million miles, which separates the orbits of these planets.

The conjunction of Mercury and the Moon on the 15th will be unobservable as the Moon will not rise till well into daylight, 13 minutes before the sun.

On the 16th Mercury will be in superior conjunction with the Sun, and Neptune on the 22nd.

On the 19th Neptune will be in conjunction with Regulus.

Beta Scorpius will be occulted soon after 11 p.m. on the 23rd, at Brisbane, Toowoomba and Warwick.

The conjunction of Saturn with the Moon at 9 p.m. on the 24th will be an interesting spectacle well above the south-western horizon, the Moon being a little more than half full and Saturn 2 degrees to the north.

The occultation of Epsilon Capricorni on the 30th will be visible throughout Queensland, occurring shortly before 4.20 a.m., at Brisbane, Toowoomba, Warwick, and other places in Southern Queensland, but earlier at more northern stations.

The Southern Cross during this month will be seen only in positions west of the southern meridian, reaching the prone position when most westerly at 10 p.m. in the beginning of the month, and at 8 p.m. at the end.

7 Sept.	☾ Last Quarter	8 35 a.m.
14 "	● New Moon	11 21 a.m.
22 "	☾ First Quarter	12 58 p.m.
30 "	○ Full Moon	10 42 p.m.

Perigee, 5th September, at 3 18 a.m.  
Apogee, 12th September, at midday.

The occultation of Jupiter by the Moon on the evening of the 4th, soon after half-past 10 in Southern Queensland, should be an interesting spectacle at Brisbane, Toowoomba, and Warwick, where the planet and the Moon will be sufficiently high above the eastern horizon to be fairly well observable.

When the gibbous Moon rises a little before 10 p.m. on the 4th, rather more than twelve degrees north of the east point on the horizon, the big planet Jupiter will be, apparently, very close to its north-eastern edge; the nearness increasing until the occultation takes place. It will be interesting to many observers to notice on the evening before, at 10 p.m., that the Moon will be almost 15 degrees (roughly speaking) above and to the west of Jupiter, a distance measured by the Southern Cross of nearly two and a-half times its length.

For places west of Warwick and nearly in the same latitude, 28 degrees 12 minutes S., add 4 minutes for each degree of longitude. For example, at Inglewood, add 4 minutes to the times given above for Warwick; at Goondiwindi, add 8 minutes; at St. George, 14 minutes; at Cunnamulla, 25 minutes; at Thargomindah, 33 minutes; and at Oontoo, 43 minutes.

The moonlight nights for each month can best be ascertained by noticing the dates when the moon will be in the first quarter and when full. In the latter case the moon will rise somewhat about the time the sun sets, and the moonlight then extends all through the night; when at the first quarter the moon rises somewhere about six hours before the sun sets, and it is moonlight only till about midnight. After full moon it will be later each evening before it rises, and when in the last quarter it will not generally rise till after midnight.

It must be remembered that the times referred to are only roughly approximate, as the relative positions of the sun and moon vary considerably.

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VOL. XXX.

1 SEPTEMBER, 1928.

PART 3

## Event and Comment.

### Science and Agriculture—The Press as an Educational Influence.

**T**HE importance of the Press as an educational influence, and the wisdom of encouraging the application of science as an aid in the solution of agricultural problems, were the main points of the opening address of the Premier, Mr. W. McCormack, at the recent annual conference of the Queensland Country Press. It was a very fine thing, he said, to have country newspapers to give expression to local opinion and to advance the interests of the districts in which they circulated. The Press had an important function to perform in the social affairs of the community, perhaps more important than those in control sometimes realised. As a medium of education the Press had a far greater duty and responsibility than many other businesses. Those first entering upon the newspaper business were often prone to forget that there was a side other than the business side. Too much attention to the profit-making side of newspaper work could cause much degradation of modern thought, and newspapers, run merely to make money, could do an immense amount of damage generally.

The difficulties of pressmen, added the Premier, were many and varied. He thought, however, that a very real need for a better knowledge of economic problems of the world, and of Australia, existed. There never had been a time when there was greater need for agricultural development on scientific lines, and, consequently, one of the greatest functions of the Press in country districts was to educate the people in the application of science to agricultural production. They had been fortunate recently to secure the visit to Australia of men of great reputation in the

scientific world, who had pointed out the urgent need for agricultural research. They had reason to be proud of the Country Press in Queensland—there were some very fine provincial papers.

Mr. McCormack hoped that the Country Press would do more “boosting” of Queensland and its products. Queensland had much to be proud of in its great record of developed wealth and of the progress and energy of its people.

### **New Agricultural Legislation—Farm Produce Disposal.**

**T**WO important amending measures, included in the sessional programme, have already been submitted to Parliament by the Minister of Agriculture and Stock, Mr. W. Forgan Smith. The first of these is a Bill to amend the Farm Produce Agents Act, and in the course of his second reading speech on the measure, Mr. Forgan Smith said that it had been found necessary as the result of further experience and the development of agricultural policy generally. The principal Act was passed in 1917, and its underlying principle was the supervision of farm produce agents in their dealings with farmers. Owing to the development of modern methods of organisation it had been found necessary by Parliaments all over Australia to make certain rules and regulations governing certain forms of trading.

This Bill would not, he explained, apply to the purchasers of produce, but only to agents for its sale. A farm produce agent was defined as—“Any person who acts as agent, broker, or factor for the sale of any of the produce defined in the Act.”

The Bill provides for the payment of the proceeds of produce disposal within thirty days of sale, and also for other forms of business protection to the farmer.

Provision is also made for the prevention of wanton waste of farm produce in a marketable condition, and the amending measure contains many other general improvements on the principal Act. “It is intended to give further protection to farmers against illegal or wrong practices by certain traders in the community,” said the Minister. “It will be welcomed by all those engaged in the industry, the majority of whom are carrying on business properly, and doing all the things that are provided for by this measure.”

In the course of his reply at the conclusion of the debate on the Bill, Mr. Forgan Smith said that there was nothing in the new legislation that would be damaging in any degree to the legitimate trader. It said primarily that the farmer should be informed of the price at which his goods were sold, and that within a given time he should receive the amount realised, less the usual expenses. “Anyone who knows anything at all about business economies,” said the Minister in conclusion, “realises that the best results are obtained by a large volume of production and quick returns. The greater the volume of production the less the average cost of production and the cost of sales become. . . . We are not compelling the farmer to send his produce to market; but we are providing a penalty for anyone who, in order to rig the markets, wilfully destroys produce of a valuable character and fit for human consumption. That does not affect produce that may be condemned by the Department of Agriculture or the Department of Public Health; but it prevents individuals working on behalf of speculators in produce creating an artificial scarcity, which is not to the benefit of anyone. The Bill is a protection to the farmer; it ensures for him a proper account of his transactions, and those engaged in the industry, the majority of whom are carrying on their business legitimately, will not be embarrassed in any manner of means by this measure.”

### **Stock Foods.**

**T**HE other new measure introduced by Mr. Forgan Smith was the Stock Foods Amendment Bill, and on its second reading he said, *inter alia*, that its main aim was to bring about an improvement in the quality of mineral foods and stock licks, which in future would be recognised as stock foods. It provided for the labelling

of stock licks or mineral food, setting out the nature and quantities of the contents of the respective containers, with the object of enabling the farmer to make himself acquainted with the quality of the commodity he is using.

In discussing the subject with Dr. Orr, of the Rowett Institute, Aberdeen, and Sir Arnold Theiler recently, the Minister was impressed by those scientists with the importance of stock foods to the pastoral industry of Queensland and the necessity for the effective regulation and active encouragement of their use.

In nearly every country attention had been directed during the last three years to stock licks, or mixed mineral foods recommended by the sellers for the purpose of supplying animals with the constituents that are wholly or partly lacking in their ordinary food.

The Federal Pastoral Advisory Committee had also dealt with this matter, and he quoted the following passage from its report as presented to the Federal Parliament:—

“The question of sheep licks is one of considerable importance. Evidence goes to show that certain licks are of great assistance in helping sheep to maintain their condition in dry periods. This is a matter that should be investigated by the Council for Scientific and Industrial Research. It could be ascertained what ingredients and their percentages are most suitable for each district. Evidence goes to show that there are many licks sold, and some are of doubtful value. The Queensland Government has set a good example by providing in ‘*The Stock Food Act of 1919*’ that, in respect of stock foods and fertilisers, an analysis of the contents shall be declared upon the label of the container, and details are furnished in the annual report of the department. It is recommended that the other State Governments should pass an Act on similar lines, requiring full particulars to be disclosed of the ingredients of stock licks and stock foods.”

The Bill before the House had the support of graziers and stockowners’ associations who had discussed this matter with him. Everyone would recognise that this was a matter of considerable importance to the pastoral industry, particularly in Queensland, and to stock-raising generally.

### **The Meat Industry Hall—A Lesson in Efficiency and Quality.**

VISITING meat experts, who saw the display in the Meat Industry Hall at the Brisbane Show, declared it to be the finest exhibition of its kind they had seen, and they were familiar with the great meat shows in the Argentine and at the Smithfield Market in London. The exhibit was beyond doubt the most comprehensive single industry display in the Show. It taught a great lesson in efficiency, educated the public in the appreciation of the true value of meat, of the characteristics of different cattle breeds, the conformation of the modern beef steer, the necessity for herd improvement, and the entire elimination of waste. The producer learnt what could be done by better breeding, and the consumer the merits of different meats, joints, and “cuts.” Every exhibit in the Hall was an object lesson of the wonderful value of the grazing industry in Queensland, and its still greater possibilities, if developed and controlled by modern ideas and practice. One section was set apart for a display of the subsidiary industries that maintained it. An extensive range of stock foods, fertilisers, and other by-products were impressively arrayed. Figures were quoted to inform the visitor of the improvement that has been made in the nutritive quality of stock foods through the application of scientific principles and discoveries. The question of suitable rations for stock was also made clear. Generally there was not a phase of the great stock-raising industry and of the great secondary industries of which it is the base, that was not presented in a simple, attractive, and impressive way. It was one of the most popular features of the whole Show, a striking lesson in quality of products, and efficiency in production, manufacturing, and organisation. Moreover, and this is the strongest point of all, it was made in Australia.

# Bureau of Sugar Experiment Stations.

## CANE DISEASES.

*The following report (10th August, 1928), has been received from the Pathologist to the Bureau of Sugar Experiment Stations (Mr. A. F. Bell) :—*

### DISEASE SURVEY OF THE BEENLEIGH DISTRICT.

In 1926, one of the field officers of the Bureau reported the presence of Fiji disease on several farms in the Beenleigh district, this being our first record of the disease having become established in Queensland. This was a very serious discovery, and since that time periodic visits have been made to the district by the members of the staff of the Division of Pathology. Practically every farm has been carefully inspected and methods for the control of the various diseases found have been outlined. In the two years under review, the improvement in the disease situation is most noticeable, and it is no exaggeration to say that with 100 per cent. co-operation on the part of the farmers, the district will be free from serious diseases within a very few years. The efforts of the farmers to bring disease under control has been very satisfactory up to the present time, with the exception of the Eagleby district, which is in a bad condition, the farmers not taking active steps to bring about their own salvation. This is a district of small mixed farms, the cane often being inter-planted with fields of corn and sorghums, and, owing to the swampy nature of much of the land, the headlands and fields are usually over-run with weeds and grasses. These conditions are ideal for the harbouring of the insects which spread Mosaic disease, and which are suspected of spreading Fiji disease. Consequently the spread of these two diseases is so rapid that it appears that the Eagleby farmers can get control only by planting resistant varieties, and for this reason the planting of D. 1135 must be abandoned. Every field of this variety is more or less heavily infected with Fiji disease, and/or Mosaic, making seed selection impracticable. Once the serious diseases have been eradicated, or practically so, then the farmers can return to D. 1135 if they should so desire.

The major diseases present in the Beenleigh district are Fiji disease, gumming, and Mosaic; there are also some very minor leaf spots, and some indications of root disease, but the latter would probably disappear if the land were in any way well drained. The lack of good drainage is one of the main factors operating against the production of high tonnages, and will, no doubt, be the limiting factor in all but very dry years. Owing to the contour of the country it would be necessary for a large drainage scheme to be undertaken on a co-operative basis or by the Government.

### Fiji Disease.

At the time of the first inspection of the district, in January, 1927, it was found that approximately 10 per cent. of the cane throughout the whole district was infected with Fiji disease and the losses were estimated at some 8 to 10 per cent. Further inspections were made in January-February, May, and July of this year, and it is now considered that the infection is less than 2 per cent. Since there has been very little reduction in the percentage infection in the Eagleby district it is evident that the control measures have been practised in the Alberton, Norwell, and Pimpama Island districts. In January, 1927, a little over 60 per cent. of the farms visited were found to be infected with the disease, while this number has not been materially reduced this year; nevertheless, the amount of disease on each farm has been greatly reduced.

Fiji disease is still the most common disease and the one responsible for most damage in this district. The symptoms are too well known to need repeating here, but a copy of a circular giving a full description of the disease will be forwarded on request to any one desirous of obtaining such. A strict watch for the disease should be maintained at all times and any diseased plants should be pulled out immediately they are discovered; when this disease is allowed to get the upper hand the results are disastrous. D. 1135, Purple Top (N.G. 64), and Green Baruma are found to be badly diseased wherever they are grown, and they should not be planted again until the disease has been practically eradicated. By far the most resistant canes are Q. 813 and H.Q. 285 (Milton), and the planting of these varieties is favoured by the Bureau.

### Mosaic Disease.

Mosaic disease continues to be generally distributed throughout the area, but serious damage is confined to the eastern end of Eagleby. In the Pimpama Island and Norwell districts, this disease is found wherever Green Baruma is grown, and it is desirable that this variety should be discarded. In all other varieties control can readily be obtained by avoiding Mosaic-infected stools when cutting seed, uprooting of all diseased stools in the young cane, and keeping the fields clean. Mosaic is spread by an aphid which does not attack cane naturally but prefers corn and a number of related grasses; avoid growing these near cane and the spread of Mosaic will usually be avoided. In parts of Eagleby the percentage of infection is too high to permit of satisfactory seed selection on the farms, and it will be necessary for these farmers to go to Alberton, Norwell, or Pimpama Island for seed.

### Gumming Disease.

Gumming disease is one of the most serious, if not the most serious, disease of sugar-cane, and it is, unfortunately, in this district now. The first symptoms of gumming are due to yellowish streaks on the leaves; these streaks are about a quarter of an inch wide and follow the direction of the veins of the leaf, that is, they run at an angle with the midrib. As the streaks become older, dead patches of leaf arise anywhere in the streak, but usually towards the margin of the leaf. In the latter stages of the disease gum may be seen oozing from the cut ends of the stems. Gumming can be spread by cane knives and also spreads from plant to plant during wet, windy weather, due to the scratching of the leaves, allowing the bacteria which cause this disease to pass in and out of the wounds.

From this year's inspections the disease appears to be confined to two small areas in Alberton and Stegelitz. In the Alberton district gumming has been found in D. 1135, Striped Singapore, and Purple Top; and all farms close to the cross roads (Ferry road) on the south side should not be used as sources of seed. At Stegelitz, gum has been found in D. 1135, near the Stegelitz wharf, and any farms in the vicinity are under suspicion. Under the circumstances we cannot practise seed selection, but the disease can be eradicated by growing the resistant canes—Q. 813 and H.Q. 5—in these areas. H.Q. 5 has proved somewhat susceptible to Fiji disease so that care must be exercised in the selection of the seed; H.Q. 285 (Milton), while resistant to Fiji disease, is susceptible to gumming and should not be grown in these areas. The importance of eradicating gumming cannot be over-emphasised and must be carried out before we can hope to introduce new varieties successfully. It is found that only about one cane in a hundred is resistant to gumming, so that once this disease appears it means the end of many good varieties.

### Rat and Fox Damage.

A considerable amount of rat damage was noted at Pimpama Island, and there is also a good deal of damage throughout the district, stated by the majority of the farmers to be caused by foxes. A proportion of the cane is broken off, but much of the damaged cane is standing and bears an injury as though crushed between the teeth of a fairly large animal. This type of injury is frequently as high as 2 feet from the ground. The variety most damaged is the brittle H.Q. 285 (Milton), and the damage done certainly warrants some steps being taken to reduce the number of foxes.

### Seed Selection.

The most profitable form of disease control is the planting of healthy seed, and all those farmers who are replanting Q. 813 and H.Q. 285, or who are replacing other varieties with these two canes, are advised to get their seed cane from one or other of the farmers listed below. These farms have all been found free from disease on at least two inspections made this year, but, nevertheless, a lookout for diseased stools should be maintained at the time of cutting the seed.

The following farmers have been issued with official permits for the sale of seed:—

*Eagleby.*—No cane suitable for sale as plants was found on this area, and the farmers are advised to get their Q. 813 and H.Q. 285 from Pimpama Island or Norwell. It would be an excellent move if the local association could arrange for some isolated hillside farm to be set aside as a clean seed nursery, and planted with cane from an approved farm.

*Alberton.*—Mr. A. Enkelmann, Ageston, Q. 813; Mr. Geike (late Mr. A. Schmidt), Q. 813.

*Pimpama Island*.—Mr. J. E. Enkelmann, Q. 813 and H.Q. 285; Mr. G. Breuer, Q. 813 and H.Q. 285; Mr. Ziltman (late Mr. W. Herbst), H.Q. 285; Mr. F. Haaek, H.Q. 285; Mr. R. Brandt, H.Q. 285.

*Norwell*.—Mr. F. Arndt, Q. 813; Mr. C. Hamel (late Mr. A. Herbst), Q. 813 and H.Q. 285; Mr. C. G. Spann, Q. 813 and H.Q. 285; Mr. B. Herbst, Q. 813 and H.Q. 285; Mr. G. Drescher, Q. 813 and H.Q. 285; Mr. G. Pinnow, H.Q. 285; Mr. A. F. Brandt, H.Q. 285.

*Rocky Point*.—Mr. E. Riesenweber, Q. 813.

*Stegeltz*.—Mr. F. G. Maas, Q. 813 and H.Q. 285; Mr. Frank Maas, Q. 813 and H.Q. 285.

### Introduction of Varieties.

Many farmers will, no doubt, wish to introduce varieties from outside districts, but attention must be drawn to the great danger of introducing new diseases by this means. Any farmer wishing to introduce another variety should communicate with the Bureau, who will advise him as to the safest source of seed.

## ENTOMOLOGIST'S ADVICE TO CANEGROWERS.

BY EDMUND JARVIS.

### "Army Worms" on the War Path.

Caterpillars of the well-known "Army Worm" (*Cirphis unipuncta* Haw.) have already been causing trouble, the young larvæ of this insect having been in evidence last month (August) at Queerah, and probably elsewhere. The caterpillar of this moth, when fully grown, resembles a cutworm in general appearance, from which, however, it may easily be distinguished by its being distinctly striped lengthwise. Its colour ranges from light greenish yellow to greenish black, and a narrow whitish stripe runs down the centre of the back and three additional stripes on each side of the body, of which the central one is dark and the others lighter. The lowest of these lines, situated just below the spiracles, is greenish yellow edged with white. The head is greenish brown and mottled with blackish, the under surface of the body being lighter than the upper, and more or less mottled.

These caterpillars usually feed at night time, hiding during the day amongst the unfolding heart-leaves of cane-shoots.

Their whereabouts, however, is betrayed by numerous pellets of excreta or powdery fragments of same scattered among the leaves or on the ground close to stems of affected plants.

Control measures are not often necessary, unless in cases of severe infestation, as these larvæ are attacked by several species of hymenopterous and dipterous parasites, predaceous enemies, and by a virulent disease known as "Wilt," which occasionally destroys 90 per cent. or more of the caterpillars.

When young cane is badly damaged and the larvæ are found to be still small or about half-grown (3 inch long), the following poison-bait should be used:—Paris green 1 lb., thoroughly incorporated with 20 lb. of bran, to which is then added 2 lb. of molasses dissolved in sufficient water to reduce the bait to a thick but crumbling mass. Sprinkle this mixture in pieces of about the size of a walnut between the cane-rows, or in a furrow ploughed in front of the advancing caterpillars, applying same just before sundown. Another good method is to spray the plants with lead arsenate, in the proportion of 2 lb. arsenate to about 50 gallons of water. This strength, if correctly made, will not injure the leaves, and while in use should be kept well agitated.

### The Beetle Borer Wakes Up.

As the season advances, accompanied by milder temperatures, the activity of the weevil-borer of cane will become gradually more noticeable. Inspection of cane growing in low-lying situations should not be overlooked, and growers discovering evidence of attack at the basal portion of sticks should lose no time in communicating with the Entomologist at Meringa Experiment Station, in order that parasites of this pest may be released on such affected areas.

**Dangers Induced by "High Cutting."**

In addition to such drawbacks as the reduction of plant vitality—owing to the failure of shoots springing from buds above ground to establish roots—high cutting has a tendency to encourage the spread of the smallest of our three moth-borers of cane, *Ephysterus chersæa* Meyr., the caterpillars of which show a preference for shoots which originate from buds above the ground. Growers should particularly note that high cutting of beetle-borer infested crops tends to leave quantities of these weevils and the grubs behind in the field after harvesting the cane, in the basal portions of the affected sticks, which otherwise would be killed during milling operations.

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*The Assistant Entomologist at Mackay (Mr. A. N. Burns) reports as follows for the month ended 12th August, 1928, to the Director of the Bureau of Sugar Experiment Stations, Mr. H. T. Easterby:—*

**Army Worms (*Cirphis loreyi* Dup.) Prevalent.**

Outbreaks of more or less minor importance of the abovenamed species of army worm have come under notice at several places near the laboratory; in some instances young plant cane being affected, and one or two blocks of young ratoons. It is well for growers to familiarise themselves with these leaf-eating pests, which at times occur in such vast numbers as to completely eat to ground level large areas of young cane in a few days.

Where cane is only slightly affected as indicated by the leaves having been eaten, a search of the central portion of the shoot, or amongst the loose clods of earth immediately surrounding the plants, will reveal the presence of these caterpillars. Feeding takes place at night, the caterpillars sheltering in the above situations during daylight hours.

The chief damage is not done till these larvæ are about three-quarters grown. From then on till pupation they feed voraciously and almost continuously.

The eggs are deposited usually singly on the young shoots of the cane plants, and, on emergence, the young caterpillars immediately commence feeding. They grow rapidly, and after moulting several times reach the final or fully-grown larval stage. They then measure approximately 1½ inches (individual specimens vary considerably) in length, and are of a pale greyish or brownish-green colour, marked with five dark smoky-brown longitudinal bands in the dorsal and subdorsal areas. The central or dorsal one of these bands is the broadest, and is constricted and fainter in colour at the junctions of the segments. Laterally and almost centrally in each segment is a black spiracular marking. The head is brown, with a V-shaped marking, greyish green in the centre, the apex of the V being at the top of the head, thus making the V inverted. Legs yellowish brown, pro-legs and anal claspers greyish or pale brownish green.

Pupation takes place amongst the loose soil particles near the base of the cane plants, and a rough cocoon is formed by drawing together small lumps of soil, debris, &c., with silken threads. The enclosed chrysalis or pupa is dark-reddish brown and measures about ¾ inch in length. The time spent in this stage is brief, ranging from twelve to sixteen days at this time of year.

The adult moth measures some 1½ inches across the expanded wings, and is coloured as follows:—Forewings above.—Pale ochreous brown with a pearly suffusion. Central area longitudinally from base to outer edge with an obscure streak, dark smoky brown; a few smoky-brown spots forming a faint interrupted line near outer edge from apex to lower angle. Hindwings above.—White, semi-hyaline or transparent, suffused opalescent, pale pinkish. Forewings beneath.—As above, but lighter in colour, almost devoid of spots or markings, except for an irregular faint smoky-brown marking at outer end of cell. Hindwings beneath.—As above, but more obscure.

At the present time large numbers of this moth are being bred through at the laboratory from caterpillars collected in the field, and up to the present time no parasitised examples have come under observation. Since there appears to be little or no apparent natural control being exercised over this insect in the present generation, it is likely that large outbreaks will occur within the next few weeks. Where observed occurring seriously, control measures may be successfully applied as follows:—

**Arsenate of Lead Solution Spray.**—Affected cane may be quickly and effectively freed from attack by these caterpillars if sprayed with a cold-water solution spray

applied with a hand atomiser or orchard spray-pump, and in the proportions of 1 lb. of lead arsenate (either paste or powder form) to 25 or 30 gallons of cold water.

To mix this material take a small quantity of the bulk water and mix with the lead into a thin cream, then add this to the remaining water. It is well to keep the spray well agitated whilst applying, as the lead has a tendency to settle at the bottom of the container. Spray is best applied in the morning or early afternoon, when it can dry on the leaves. Once it has dried it is not readily washed off by rain.

Should the caterpillars be in excessive numbers and moving en masse, it is wise to spray a couple of rows of clean cane in front of their advance as well as the cane already being eaten.

Another effective method of artificial control is to plough a furrow in front of the advancing caterpillars, taking care to have the vertical face of the furrow opposite their advance. This causes an obstruction, consequently large numbers become concentrated in the furrow, where they may be readily destroyed.

The true "army worm," *Cirphis unipuncta* Haw., which usually occurs most freely in canefields, and greatly predominates over *C. loreyi*, is, fortunately, so far not in evidence in the Mackay and surrounding districts. It may be readily distinguished in the caterpillar stage from *C. loreyi*, as its larvæ are darker in colour, being a dark greenish black. The control measures described above apply to this and all other species of leaf-eating "army" or "cutworms" that occur in swarms or armies.

### Prevalence of Large Moth Borers (*Phragmatiphila truncata* Walk.)

In last month's report mention was made of caterpillars of this borer having been found in mature canesticks. A particular field has been kept under observation, where fairly large numbers of these borers were found in the stick.

Infestation was observed to be worst in the cane adjoining headlands and along the outer rows. This cane has since been cut, and what young shoots have since sprung up have been carefully examined. Infestation in these varied considerably; it was estimated to be as high as 70 per cent. in three rows adjoining a roadway (as taken from affected shoots per stool for a certain distance), and over the whole field could safely be estimated at least at 20 per cent.

Large numbers in all sizes were collected for breeding at the laboratory, and to date none have yielded any natural parasites. Cutting out any affected shoots is the best and most practical way of dealing with this pest; any shoots cut out, however, should be cut away from the stool as near the point of attachment as possible. This was demonstrated clearly in collecting examples from the above field; more than half the specimens obtained occurred from fully 1 to 2 inches below ground level, in the extreme bases of the shoots, and even then some specimens were cut in half.

The earliest indications of shoots being attacked is a shrivelling of the central leaves, followed by "wilting" and complete dying in many instances. It is in this earliest stage that attacked shoots should be cut out and burned; if left till the central leaves are quite dead, the caterpillar will probably have moved and eaten its way into other healthy shoots.

Most of the infestation in mature sticks has been observed in this district to occur in H.Q. 426 and B. 208. In young plant or ratoon cane any variety may be subjected to attack; in this district, however, the severest infestation so far noticed has been in H.Q. 426 and Badila.

### Beetle Borer of Cane (*Rhabdochnemis obscurus* Boisduval).

Fortunately this district is comparatively free from this pest, which causes so much damage to cane in the districts further north. Some examples of Badila cane brought to the laboratory last month for testing were found to contain larvæ of this beetle; so a visit was subsequently paid to the farm and adjoining ones that this affected sample of cane came from.

Although a careful search was made, the borer was located on only one other farm besides the one from which the affected sample of cane was brought, and in each instance the borers were found in Badila cane only. Infestation was very light, sticks here and there only being bored, and were in places where the cane was down through having been partly submerged during the floods in the late summer months. Rat damage was fairly bad, particularly near the headlands, where the grass was long and dense. In each instance the cane was growing along the river bank and was bordered by dense scrub and boggy ground. The borer damage was not severe enough to call for control measures.

**FERTILISING EXPERIMENTS.****FOURTH SERIES.**

Below are given some of the results of manures at the Mackay Sugar Experiment Station when cane brought a much lower price than at the present day. Even then, however, good financial results were shown from the use of manures.

The tonnages of cane per acre are high, but this was largely due to the excellent cultivation methods practised. None of this cane was irrigated.

Results of experiments made in 1902-3 with different fertilisers and lime, at the Sugar Experiment Station, Mackay. Cane used for experiment—Rose Bamboo or Rappoe. Plant Cane. Value of cane at mill, 20s. per ton.

Manure Applied per Acre.	Tons of Cane per Acre.	Increased Yield due to Fertilisers in Tons Cane per Acre.	Cost of Manures and Application.	Increase in Value of Crop due to Fertilisers.
			£ s. d.	£ s. d.
400 lb. Sulphate of Ammonia and Nitrate of Soda mixed	48.9	8.4	3 16 0	4 12 0
200 lb. Sulphate of Potash ..	49.5	9.0	1 16 0	7 4 0
2 tons Burnt Lime .. ..	46.7	6.2	6 0 0	0 4 0
300 lb. Superphosphate ..	43.2	2.7	1 10 0	1 4 0
No Manure .. .. .	40.5	..	..	..

Results of experiments made in 1908 with mixed fertilisers at the Sugar Experiment Station, Mackay. Cane value at that time, 22s. per ton. Second ratoons.

Manure Applied per Acre.	Tons of Cane per Acre.	Increased Yield due to Fertilisers, in Tons Cane per Acre.	Cost of Manures and Application.	Increase in Value of Crop due to Fertilisers.
			£ s. d.	£ s. d.
Mixed Manure containing 3 cwt. Sulphate of Ammonia, 1 cwt. Sulphate of Potash, and 3 cwt. Superphosphate .. ..	38.8	14.7	5 0 0	11 3 4
No Manure .. .. .	24.1	..	..	..

Results of experiments made in 1909 with mixed fertilisers. Cane value at that time, 22s. per ton. Third ratoons.

Manure Applied per Acre.	Tons of Cane per Acre.	Increased Yield due to Fertilisers, in Tons Cane per Acre.	Cost of Manures and Application.	Increase in Value of Crop due to Fertilisers.
			£ s. d.	£ s. d.
Mixed Manure containing 2 cwt. Sulphate of Ammonia, 2 cwt. Nitrate of Soda, 1 cwt. Sulphate of Potash, and 4 cwt. Superphosphate .. ..	35.95	16.09	6 13 4	11 0 11
No Manure .. .. .	19.86	..	..	..

Results of experiments made in 1909 with mixed fertilisers at the Sugar Experiment Station, Mackay. Cane used for experiment, N.G. 24 (Goru). Third ratoons. Value of cane at mill, 22s. per ton.

Manure Applied per Acre.	Tons of Cane per Acre.	Increased Yield due to Fertilisers, in Tons Cane per Acre.	Cost of Manures and Application.	Increase in Value of Crop due to Fertilisers.
			£ s. d.	£ s. d.
Mixed Manures, 6 cwt. per acre, viz. :— Sulphate of Ammonia, Nitrate of Soda, Sulphate of Potash, and Superphosphate ..	49.0	23.2	4 10 0	21 0 4
No Manure .. .. .	25.8	..	..	..

### CANE PEST COMBAT AND CONTROL.

The Director of the Bureau of Sugar Experiment Stations, Mr. H. T. Easterby, has received from the Entomologist at Meringa (Mr. E. Jarvis) the following monthly report for the period of July to August, 1928:—

On the 19th July I visited Deeral, which is situated about 27 miles from Cairns on the North Coast Line.

Between Gordonvale and Aloomba the standing cane in many places showed evidence of having been more or less injured by grubs; such injury being apparent also amongst the young shoots of various ratoon crops, many of which were stunted or had failed to make uniform growth.

Much of the cane between Aloomba and Deeral appeared to be similarly attacked, but in many instances the sickly yellowish-green colour of plantations noticed near Fishery and Fig-tree Creek, where much of the growth was stunted, did not display characteristic signs of grub affection, the trouble having apparently resulted from defective drainage and indifferent cultivation. Much of this level cane area in the vicinity of Deeral—consisting of what is usually termed "palm land"—is inclined to be more or less swampy, and appears to be composed mostly of decomposed granite containing surface soil and humus, derived probably from the western slopes of the Bellenden-Ker range about 2½ miles distant, the mountains of which are of granitic formation.

The area in question is bordered to the east near the Mulgrave River by belts of jungle land, supporting great numbers of an elegant species of palm (*Achontophoenix* sp.), the stems of which, although only 4 to 7 inches in diameter at the base, frequently attain a height of 50 to 70 feet or more, and may often be seen waving their crown-like canopy of leaves high above the general level of the scrub trees. Many growers believe that this class of country is no good for sugar-cane; and certainly, some of the crops grown on it would appear at first sight to justify such opinion.

#### Growing Cane on "Palm Land."

Upon visiting the selection of Mr. H. G. Lander, however, at Deeral, I was most interested to observe the methods by which he has succeeded in producing on this so-called "palm land," fine healthy crops of cane. The secret of his success must be attributed primarily to thorough draining of the ground, which has made possible the practice of good methods of cultivation. The excavating of more than 3½ miles in length of channelling, however, is no light matter, and must have entailed much strenuous labour, but has evidently proved well worth the trouble. The need for such work becomes imperative in view of the heavy rainfalls experienced at Deeral, where on one occasion, during the wet season of 1925, no less than 24 inches of rain was reported to have fallen in twenty-four hours.

Sugar growers in other countries have commenced to realise that drainage is almost, if not quite, as important as irrigation on flat lands. Much of the area between the North Coast Line and the Bellenden-Ker ranges cannot be expected to produce good crops of cane until it has been properly drained and well cultivated.

In order to be effective and obtain maximum results the drains should be made large and deep enough, and be carefully laid out as to grade and alignment, so that they will not become clogged, and will hold the ground water at a level that will allow plenty of feeding room for plant roots.

The plan adopted by Mr. Lander has been to cut several main open drains, forming a series of straight, parallel lines a few chains apart, which, commencing on the eastern boundary of his land, run in a due westerly direction. Connected with these open channels, which have a slight natural fall towards the Mulgrave River, are a number of cross drains, consisting of a layer of palm-tree trunks about 24 inches deep covered over by a couple of feet of soil. Many of the palms used are 40 feet or more in length, and being exceedingly hard and durable have been found to last several years in the ground. These cross drains are about  $4\frac{1}{2}$  feet wide by 4 feet deep, the longer open channels being slightly larger.

In this connection it may be mentioned that the depth of such drains happens to be a matter of no little importance, since it has a direct bearing on the aeration of soil so treated. When the surplus moisture is drained off in this way from low-lying lands inclined to be swampy, the air is then able to fill the interstices between soil particles to the full depth of the cultivation given. In addition to increasing the fertility of the land, such increased aeration provides ideal conditions for the treatment of grub-infested areas with soil fumigants. Most of the failures, indeed, experienced by our growers in the past to obtain the best results from the use of carbon bisulphide have been due to its having been applied to fields which were not sufficiently aerated to allow the toxic fumes to permeate uniformly throughout the depth of soil in which the cane-grubs were working.

### Effect of Drainage on Cane Diseases

We know that defective drainage sometimes exercises a decided influence on the occurrence of certain fungus diseases of cane. Crops growing on poorly-drained areas, for example, are bound to suffer more or less from lack of vitality arising from indifferent cultivation and the presence at times of stagnant water, such adverse conditions—especially when obtaining on clay lands or heavy loams—often favouring the development of Rind disease and certain leaf fungi.

Chlorosis, again, which is an affection believed to be due to inability of the plant to take up a sufficient amount of iron, is known to be largely brought about by fungoid disease of the roots, induced by the abovementioned adverse soil conditions.

Many years ago, in Victoria (1900) a serious malady of wheat and other cereals known as "Take All," which at that time was responsible for very heavy financial losses, was ultimately discovered to be due to defective drainage of the wheat lands, and was successfully combated by improving the aeration of affected areas as far as possible and then applying a dressing of lime at the rate of not less than one ton per acre.

The importance of freely liming certain cane lands has repeatedly been stressed by our Director (Bulletin No. 3, General Series, Second Edition, revised, pp. 10 and 11, 1924).

With regard to the effect of lime on newly-drained land, the chief mechanical advantages derivable from such treatment of heavy soils would, of course, be an increased friability and porosity.

### Effect of Drainage on Growth of Sugar-Cane.

The chief varieties grown by Mr. Lander are Badila, D. 1135, and Clark's Seedling, the most suitable of these being, perhaps, D. 1135. His heaviest crops, however (from 28 to 30 or more tons per acre), have been secured from Badila, carrying a c.e.s. of 16.0. Some trial plots of B. 147 and Black Innis (M. 189) were making good growth, the former variety stooling well, with many of the sticks about 10 feet high; while Black Innis showed canes from 5 to 6 feet in height.

At the time of my visit there were about 41 acres under cane, and an additional 13 acres under grass or other crops.

It was interesting to note that *Ceromasia sphenophori* has become established at Deeral, pupæ of this insect being found by us in cocoons of *Rhabdoenemis obscurus* Boisd. cut out of old butts of Badila canes. As no liberations had been made at this point of the line, these parasites had probably travelled from Babinda, aided by the south-easterly trade wind.

Various other matters of scientific interest which need not be mentioned here claimed attention, but I should like to take this opportunity of thanking Mr. Lander for hospitality extended during the occasion of my visit to his plantation.

## FIELD REPORTS.

*The Northern Field Assistant, Mr. A. P. Gibson, reports (21st August, 1928):—*

### MOSSMAN.

#### Weather and Crops.

For the first seven months of the year 66.26 inches were recorded; 37 inches of this amount fell during February; only 2.72 inches had fallen during the last three months.

Five thousand five hundred acres were harvested, which produced 76,698 tons of cane, from which 10,670 tons of sugar were bagged. Though 7,881 tons less cane were milled, the sugar manufactured was only 527 tons below that made in the year 1926. Superior mill work and a higher-quality cane were mainly responsible for the improved output.

Following were the major cane varieties milled, together with their respective areas grown and the percentage c.e.s.:—

Variety.	Area Under Crop.	Area Percentage.	Percentage, C.C.S.
	Acres.		
H.Q. 426 .. .. .	1,549	28.2	15.21
Badila (N.G. 15) .. .. .	1,375	25.0	15.01
Q. 813 .. .. .	197	3.6	15.0
B. 147 .. .. .	314	5.7	14.22
Goru family .. .. .	120	2.2	13.90
D. 1135 .. .. .	1,281	23.3	13.85
Black Innis (M. 189) .. .. .	128	2.3	13.30
Mixed kinds .. .. .	536	9.7	..

It will be seen that H.Q.426 still holds pride of place as far as tonnage and sugar are concerned. The district's average cane tonnage was over half a ton less than that of 1926.

Particulars of the four main areas harvested are given below:—

Place.	Area Harvested.	Tonnage Received.	Tons per Acre.
	Acres.		
Mossman .. .. .	2,363	38,775	16.4
Miallo .. .. .	1,629	17,835	10.9
Cassowary .. .. .	896	12,271	13.7
Mowbray .. .. .	612	7,817	12.8
	5,500	76,698	13.9

The Mossman sugar land is alluvial, patchy, scattered, and purely coastal. The district tonnage per acre could be raised by more judicious manuring, drainage, better crop husbandry, coupled with improved plant selection. Some farms are returning satisfactory yields, many are not. This, of course, applies more or less to all districts and all industries.

#### This Season's Yield.

Early in the year crop prospects were highly promising. Dry weather, cane grubs, field rats, and early tasselling reduced the early forecast from 90,000 to 80,000 tons.

Whyanbeel Creek section seems the present hope of the Mossman. Development is being speeded up; a permanent railroad, requiring many bridges, has been con-

structed some distance into this valley. The soil, though good, is patchy and rather broken. Some nice Badila crops were observed.

The Mossman area looked rather better than usual; this region produces fully half of the mill's annual supply.

### Harvesting.

All the cane is fired prior to cutting. The merits and demerits of this practice have been many times discussed. Many small farmers harvest their own crops; by so doing costs are much reduced. Money is lost on the subsequent crop because of its very slow removal and the lack of time to properly cultivate, consequently smaller yields are cut.

### Milling.

The factory is doing good work, and, though milling 37 tons of cane per hour, seems unable to keep up to the supply, therefore is working most of the time on a full yard of all burnt cane. For the week ending 28th July, 4,958 tons of cane were treated for 722.75 tons of sugar at 94 n.t. The mill average c.c.s. in cane was remarkably high, being 14.73 per cent.

### Varieties.

It is improvident for small farmers to experiment with every new and old variety that can be got hold of. The importance of selecting healthy seed is ever being impressed on our growers; also the need of close study of the varieties suitable for their types of soils. The area generally cannot be classified as a Badila-growing one, nevertheless more of it could be profitably grown. H.Q.426 seems the best cane for the medium-quality land, and foremost in sugar content. B.147 is superior to D.1135 in quality, but is a poorer germinator. Q.813 is a good striker, a good disease resister, and a good sugar producer, but generally is unpopular, due mainly to its reclining nature; the growing of this kind might be extended with profit. 7R428 (Pompey) is really a poor land cane and a late maturer. There is a growing tendency to plant this kind on soils too rich for it, also to plant too early (September or October is time enough). This variety should be planted rather sparingly until its quality has been proved.

### Graphs.

It is suggested that our chemists make graphs recording the weekly c.c.s. rise or falls of the major canes milled, together with the recorded rainfall. The value of this information is obvious to both grower and miller.

H.Q.285, Oramboo, Korpi, Nanemo, H.Q.409, and E.K.28 are worth-while canes, and the growing of them is worthy of more encouragement.

### Pests and Diseases.

Field rats are working havoc in crops growing near the numerous freshwater grassy creek banks. This destruction, coupled with that of pigs and grubs, is a factor that has diminished greatly the season's tonnage and raised considerably the harvesting rates.

Weevil-borer destruction, which was severe at one time, is now hardly noticeable; the burning of all cane and the drier conditions appear to have subdued this pest.

Downy Mildew or Leaf Stripe is the major disease noted here, and is found largely in varieties B.147, D.1135, M.Q.1, and to a lesser degree in Badila and Q.813. This is a complaint spread mainly by infected seed and wind, therefore, it is recommended to start clearing fields from the windward side of the farm.

### CAIRNS.

This area was recently reported on, therefore little of any consequence can be added. The weather still keeps dry; such conditions are ideal for the speedy crop removal and the advancement of all field work. The cane being straight and heavy is enabling the harvester to cut a greater daily tonnage, and, in consequence, most mills are over-supplied. The plant and new ratoon crop is coming along nicely despite the dry time. Rain is, however, urgently wanted to maintain the crop growth. B.156, removed from a Mosiac-diseased field at Highbleigh and planted at Redlynch, produced the like disease, thus proving the danger and folly of planting such canes.

*Mr. E. H. Osborn, Central Field Officer, reports (22nd August, 1928):—*

### HOME HILL.

The principal cane varieties grown are Badila (N.G.15), B.208, Clark's Seedling (H.Q.426), M.1900, Q.813, and E.K.28. The last two canes named are probably about the two latest canes introduced to be grown in any quantity, but E.K.28 stands right out on its own for financial results in suitable ground. Practically every grower has a paddock of it, and extra large areas seem to have been planted this year. Its ratooning qualities are sometimes questioned, but if ratooned at once, fertilised at the same time with 3 or 4 cwt. of a good manure, the results will pay—that is, of course, if the weather is not too dry or there is no water available.

As far as the writer can judge, fertilising will become a big factor on the Burdekin lands ere long, and it is just as well to wake up to it. The writer has been visiting the district for nearly eight years, and each year sees far more fertilisers (green or artificial) used.

The following results upon a 5-acre block of H.Q.426 on Mr. Peter King's farm, are of interest:—Plant cane, 160 tons; first ratoons, 157 tons; second ratoons, 189 tons cut at ten months old, the result of the first ratoons being fertilised with 2 cwt. of sulphate of ammonia.

Another paddock, 4½ acres, of N.G.15 (Badila) gave:—Second ratoons, 138 tons; third ratoons, 142 tons, cut at eleven months old. In this case the second ratoons were fertilised with 2 cwt. of Howe's Mixture and 2 cwt. of sulphate of ammonia.

The Mackay Experiment Station has forwarded some of the newer South Johnstone seedlings, and also some P.O.J.2714, to be tried out under local conditions. Their growth will be watched with much interest.

### Tractors and Trucks.

The former are represented by practically every type of machine, and account for a great deal of work: unfortunately, it is in many cases, a rough class of work that it carries out, and it would not compare at all favourably with the ploughing insisted upon a few years ago, say with a good team drawing a double furrow plough. As for motor-drawn transport, it is now so very common that it looks as if horse-drawn cane wagons will be a thing of the past within a very few years.

The Home Hill Agricultural Show was held during last month, and the committee is congratulated on the very successful initial meeting. Large entries were received, and the cane exhibit was a really good one, but hardly as numerous in exhibits as one would have wished. Next year the writer hopes to see an exhibit of cane that will make Ayr look to its laurels, and that means a great deal.

### AYR.

Very dry conditions were being experienced when this area was inspected, for only 31.24 inches of rain had been registered during the year. The two local mills, Pioneer and Kalamia, were doing good work towards reducing their respective totals of 116,000 and 148,000 tons of cane each, and no industrial dispute was causing any delay. As regards the crops that are being cut they are slightly under the original estimate. That is probably the result of too much dry weather and the very early and excessive arrowing of nearly all the varieties of cane. The density in each mill was steadily improving, and was then between 15 and 16.

Large acreages of young cane were noticed throughout the district. Of this the cane planted in March and early in April looked very well, but a great deal of the later-planted cane was indifferent, in fact, in many places was bad.

One of the best strikes noticed was a 20-acre March planted block of E.K.28, owned by the Kalamia Estates. The block had had two crops of green manure ploughed in, and the splendid growth and heavy stooling of the cane showed how the crop was benefiting by such treatment.

In the Pioneer area, several blocks of N.G.15, estimated at 70 tons per acre, were noticed; in one instance 12 acres were put down for 840 tons. Some magnificent crops of E.K.28 were also seen; in one or two cases it was evident that the land was too rich for such a cane, for N.G.15 nearby was in the vicinity of 70 tons per acre, and where such tonnages can be obtained Badila is the cane to grow.

Q.813 has been planted out to a certain extent locally, and as a quick grower, splendid striker, and generally high sugar content, it is hard to beat, but unfortunately is prone to lie down too easily, and also carries an undue proportion of

trash. The latter two reasons are always excuses for asking permission to burn, and, naturally, the mills want to cut as much green cane as possible.

Korpi.—A small twelve-month-old paddock of this variety, cutting probably about 35 tons per acre, was noticed upon Plantation Creek. As this cane has analysed very well upon this farm for the past two years, and now seems to be a healthy and vigorous-growing variety, this year's returns will be of much interest to local growers. It might be mentioned that most of it is being used for plants.

Of the new South Johnstone seedlings, Mr. Geo. McKersie, Clare road, has several of the most promising all growing vigorously alongside some especially heavy Hybrid No. 1 and B.208. Arrangements had been made, through the courtesy of the Pioneer Sugar Mill's management, to have same analysed for the Bureau of Sugar Experiment Stations, but such figures were not available before I left the area.

### Fertilising.

Wherever fertilisers had been used, this year's cane shows the benefit of it. Several experienced growers, in speaking of the practice, expressed their belief that the average crop of fertilised ratoons would cut at the rate of about 20 tons per acre against, say, a return of 12 tons for non-manured crops. These figures certainly emphasise the writer's comments upon fertilisers in reference to Burdekin conditions.

During my visit to the district the Ayr Show was held, and it was certainly a splendid exhibit of cane—all first class—and practically every stick was worthy of a prize in any cane show in Queensland.

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*Mr. J. C. Murray, Southern Field Officer, reports (23rd August, 1928):—*

### BAUPLE.

#### Crops.

Crops are not heavy, but they are sound. As the cane is not rank and the cutting is not starting too early, the sugar content should be good.

Farmers were advised to defer planting until the end of August or the first week in September. The reasons for this are as follows, and these apply to all Southern districts:—(a) The soil is at present much below germinating temperature; (b) if plants lie in the ground longer than three weeks they are often then attacked by fungous growths; (c) if cane is planted too early heavy financial loss is caused to the growers by supplying, or, very often, complete ploughing out; (d) experience in the past, which is an effective basis for comparison, proves that any period before the end of August is a very risky one in which to plant. (Early spring planting is referred to.)

Some of the cane is arrowing; an approximate estimate would make the arrowed cane to be about 5 per cent. of the total. When a stick of sugar-cane is going to arrow it stops growing leaves and in their place produces a long spike, which might be called a flower-spike, and this in its turn has many small branches carrying a large number of flowers. This grows until it stands well above the leaves, when it finally expands, opens its flowers, and in some instances matures seeds. Cane which has flowered can only make further growth through the shooting of the eyes. Cane is generally at its maximum sugar value about six weeks after the signs of arrowing appear.

#### Local Fertilising Experiments.

Farmers are again recommended to carry out local fertilising experiments. It can be said quite earnestly that these experiments would be of great benefit to themselves, as the losses in sugar production are heavy through the misapplication of manures. The average grower knows quite a lot, in a practical way, about soil and the use of fertilisers and green manures, but he somehow does not realise that fertilising can be made an exact (and should be an exact) farming operation. But this exact information can only be obtained by three or four years of simple, local experiment. The fertilisers he uses for his experiments will finally pay for themselves, and the labour involved should not go beyond the ordinary routine of farm work. Information as to how to experiment can be obtained by reference to the annual report of the Bureau of Sugar Experiment Stations, from published field reports, and by asking any Bureau field officer for the information. One great evil of the hit or miss method is that many growers become discouraged through getting no results, and so neglect the essential and proper feeding of their soils. History shows that English soils reached a very low state, through lack of manuring, in the Georgian

periods. Byron it was who was moved to say, in reference to the failure of the wheat crops and cereals generally, "She fell, with oats, like Bonaparte." And so fertilising in Queensland must be done if the soils are to be kept productive, and although, with many farmers, it may be inexpedient to restore their soil at present, they can at least gather for themselves more accurate information about the needs of their fields.

### NAMBOUR.

#### Weather and Crops.

Crops here are not heavy this year, the persistent rains during the growing period having the effect of considerably checking development. However, it is surprising, when the rainfall figures are looked at, that the cane did as well as it has done. The hill soils can naturally take more rain without injury than peaty river soils, but this is to a certain extent counterbalanced by the fact that river soils, being richer in vegetable matter, can stand more drought.

Cane varieties recommended to the growers are Q. 813, Q. 1098, Q. 822, Q. 812A, and H.Q. 285. There is also a striped sport of Q. 813 making a very good showing. Farmers can, on communicating with the writer, obtain more information about the above varieties. They are also reminded that it is very unwise in this district to transfer plants without a thorough inspection by a Bureau officer.

The following is a description of the Q. 813 sport:—Manner of growth—Erect. Stooling properties—Good. Root system—Small. Foliage—Erect, light green, drooping at tip. Description of stick—An equal distribution of parallel green and red stripes running from the base to the growing point, internode slightly barrel-shaped and lightly waxed; eyes prominent and reposing in long, deep eye-groove; leaf-scar prominent; wax-band heavy; root-band about half an inch wide, no noticeable aerial shoots. Shows no arrows as yet.

Farmers are recommended to discard such canes as those locally called "White Badila" and Mahona. Great care should be exercised in planting N.G. 15, N.G. 16, Black Innis, and D. 1135, mainly because these varieties are susceptible to disease.

### DAMS AND DAUGHTERS—HOW A SIRE CAN INFLUENCE A HERD.

Evidence of the tremendous influence exerted by the herd-sire on the future herd is forthcoming in the following particulars received from a well-known Southland (New Zealand) dairy farmer.

Mr. W. Young, Otahuti, has been a keen supporter of the herd-testing movement in Southland since its inception three or four years ago. This breeder also realised that herd-testing could only accomplish its real purpose when used as the basis of culling and breeding operations. Quite early in his testing career, Mr. Young purchased the purebred Friesian sire Bainfield Topsy Prince, by Prince Pietertje of Bainfield—Topsy 10th—and placed him at the head of his herd. The first of the daughters of Topsy Prince to come into profit were milked and tested in the herd last season. A week or two ago Mr. Young received his final return for the season under Association test, and the figures opposite the names of the first-year heifers make interesting reading. Bainfield Topsy Prince sired nine heifers which in their first season averaged 267 lb. of fat in 239 days. That is a splendid performance, but when the individual records of daughters and dams are compared, the records are even more striking. Here are a few of them:—

No. 1.—Dam under test yielded 268 lb. fat in 229 days—daughter by Bainfield Topsy Prince under test yielded 285 lb. fat in 231 days.

No. 2.—Dam under test yielded 208 lb. fat in 209 days—daughter by Topsy Prince under test yielded 253 lb. fat in 241 days.

No. 3.—Dam under test yielded 338 lb. fat in 255 days—daughter by Topsy Prince under test yielded 331 lb. fat in 241 days.

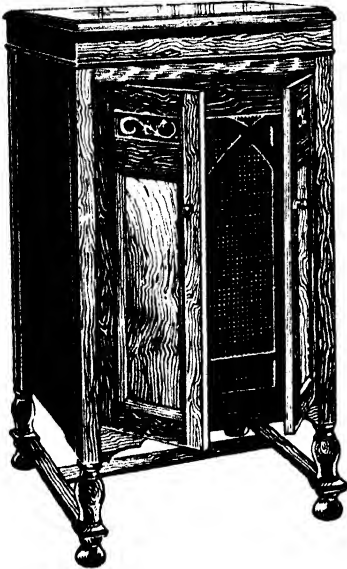
No. 4.—Dam under test yielded 286 lb. fat in 262 days—daughter by Topsy Prince under test yielded 290 lb. fat in 248 days.

No. 5.—Dam under test yielded 185 lb. fat in 255 days (since culled)—daughter by Topsy Prince under test yielded 253 lb. fat in 234 days.

Mr. Young had experiences on the other side of the picture, however, as the following cases show:—

No. 1A.—Dam under test yielded 444 lb. fat in 259 days, whilst her daughter by a purebred Shorthorn bull yielded only 165 lb. fat in 235 days.—"The New Zealand Farmer."

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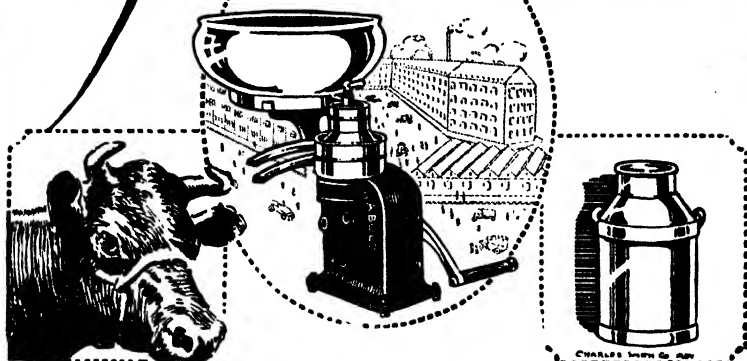
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## MEALY BUG ATTACKING PASPALUM GRASS IN THE COOROY DISTRICT.

By W. A. T. SUMMERVILLE, Entomological Branch.

**I**N November, 1926, this Department was notified that the *Paspalum* grass in part of the Cooroy district was being attacked by a "disease" which appeared to be killing off many acres of grass on the pastures.

An inspection was at once carried out, and it was ascertained that a small scale insect, belonging to the group commonly known as mealy bugs, was responsible for the damage. At that time the insect was confined to one patch of about 10 acres on two adjoining farms to the south-east of Cooroy township. From information supplied by owners of the holdings it was learned that the injury was first observed in February of that year. At that time it was confined to a small patch in one paddock. The insect then began to spread rapidly, and, so far as had been observed, steadily throughout the year.

On returning to the district twelve months later it was found that several more farms were affected, and by this time (November, 1927) at least six pastures were being attacked. The heaviest damage was now being shown in the West Cooroy area, a distance of about 5 miles from the original infestation. Meanwhile, very little improvement had taken place in the south-east part, but the area attacked had not appreciably increased. In all cases the outbreak occurred in isolated patches of a few acres.

One feature of the attack was that in every case the insect was confined to the northern slopes of ridges, and nowhere could any trace of the depredator be found on the southern aspect. The northern side is protected from the south-east winds which, as a general rule, blow fairly strongly in these parts. The northern aspect also is more exposed to the sun than is the southern.

### The Injury.

The first symptom which is noticed is that the grass, instead of being the normal green or at worst an unhealthy yellowish green as it is in most old pastures, begins to turn purplish at the tips and along the margins of the leaves. This symptom is not characteristic of mealy bug attack only, but is also found in other cases of nutritional disorders.

In the case of mealy bug damage the purple-coloured area soon extends and may ultimately embrace the entire leaf and sometimes the leaf-stalk as well. The leaf usually presents a somewhat crinkled appearance along the margins. Soon the plant becomes completely withered and brown. In most cases the whole upper portion dies and no sign of life is manifested by the plant.

The insects never penetrate the surface of the soil, but examination of affected plants will disclose their presence on the leaves and stalks almost to the ground level. Usually they are found clustered together as near the base of the leaf-stalk as they can get. In the most severely attacked plants the whole base is covered by the white mealy and filamentous secretions cast off by the insects. The number of insects

feeding on a single plant varies greatly, and from half a dozen to thirty or more may be observed. In the thick matted grass, where the attack is actually always most severe, the presence of the insects may be completely concealed from a casual observer.

The insects are frequently found sheltering under any object such as a piece of wood or manure, and on turning over such the whole lower surface may be found to be whitened by the insects and their secretions.

Some idea of the damage done may be obtained when it is stated that a patch, say 5 or 6 acres, subjected to the ravages of the insect for about two months, can be picked out from a distance of 7 or 8 miles as a brown-coloured plot in striking contrast to the healthier green of the surrounding ridges.

The insect spreads fairly rapidly. In one instance, in the course of ten months, a paddock of over 12 acres was transformed from an ordinary pasturage into a practically bare field. The insect may be spread in various ways, but probably the quickest dissemination is the result of the strong breezes which usually sweep over the ridges in the affected areas. In fact, at times when endeavouring to collect living material, we were greatly handicapped, for on disturbing the upper dead leaves the wind caught the insects and whirled them away before we were able to collect many.

#### Host Plants.

*Paspalum* grass (*Paspalum dilatatum*) was the only plant on which the insect was found to feed in the pastures. Moreover, Rhodes grass (*Chloris gayana*) growing in a badly affected field was left quite untouched. However, when subjected to tests, it was found that not only will the insect live on Rhodes grass, but can change over from *Paspalum* to Rhodes at almost any stage of its life cycle and continue to thrive and reproduce. In addition to this the mealy bug survived for many weeks on Kikuyu (*Pennisetum longistylum*), and there is nothing to suggest that it will not breed on that grass. However, there is no doubt that *Paspalum* is much preferred. No Dicotyledons were found to support the bug.

#### The Insect.

The specific identification of the insect is not yet known. Specimens have been referred to an authority on the group, but it will be some time before his decision is received. The insect is referable to the genus *Pseudococcus* of Signoret, but more recent workers on the group have altered the classification a great deal, and it is quite possible that our species will prove to be placed in another genus, possibly *Macrocerococcus* of Leonardi.

As has been stated the insect belongs to a large group commonly called mealy bugs. The popular name is given on account of the white floury secretion with which the body of many of them is covered. The particular species with which we are dealing is a typical member of the group. The larvæ and adult females are covered during the greater part of their lives by this snow-white secretion, which, in addition to covering the whole upper surface of the body in the form of a powder, also takes the form of slender filaments projecting in all directions from the upper surface and sides of the body.



FIG. 2.

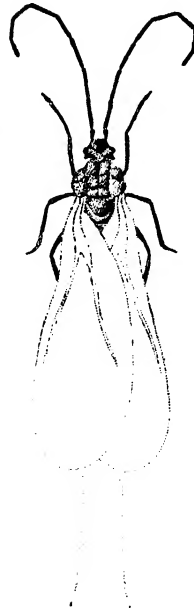


FIG. 1.

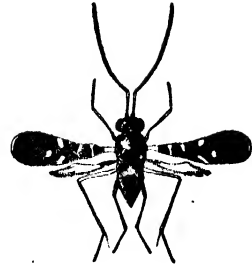


FIG. 3.



FIG. 5.

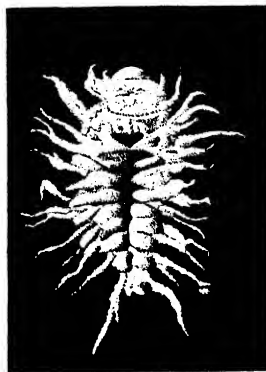


FIG. 4.



FIG. 6.

*W. Helmsing*  
1928.

PLATE 50.—PASPALUM MEALY BUG.

Fig. 1.—Mealy Bug. Adult Male x 23. Fig. 2.—Mealy Bug. Adult Female x 3. Fig. 3.—Chalcid Wasp (*Leptomastix gattatipennis* Gir.). Adult Female x 6. Fig. 4.—Ladybird (*Cryptolaemus montrouzieri* Muls.). Larva x 6. Fig. 5.—Ladybird. Pupa x 6. Fig. 6.—Ladybird. Adult x 6.

### **The Larva.**

The adult female does not lay a typical egg, but the young larva is born in a single investing membrane. The exact significance of this membrane is not quite clear. It is closely apposed to the insect, and in no way suggests a typical chorion. If it is not a chorion the female must be considered viviparous.

The period over which the young are actually extruded varies. In cases observed the operation was spread over from three to seven days. As the time for reproduction approaches the female becomes more compact and loses most of her filaments. The young, sparsely wrapped in long white filaments, are ejected by the female in pairs at intervals of about half an hour. After remaining quiet for about five minutes a slight swaying movement of the head is commenced. This motion causes the membrane to rupture at the anterior end. Soon the movement becomes stronger, and the antennæ, heads, legs, thorax and finally abdomen, are freed, and the membrane passes off at the anal end. This takes approximately thirty minutes, and the young larva is then capable of crawling about. It remains for some time crawling over the body of its mother, and eventually goes off and soon settles down to feed on the plant.

The young larva usually chooses a position close to the midrib of the leaf, and generally on the under surface, for in such a position it can most easily obtain a good supply of food material. The larva at first is scarcely visible to the naked eye, being a dirty-green colour and measuring slightly less than one seventy-second of an inch in length. In this stage it is quite bare of any secretion. After a short period of comparative activity, lasting from one to three days, during which they disperse over the plant, the young insects settle down to feed, and from that time on they rarely move any distance. The floury secretion is soon produced, and in cases examined filaments appeared after eight to ten days. As the larva grows the filaments increase in number and length until ultimately those on the posterior end, which are the longest and most numerous, reach a length of over one-quarter of an inch, while those on the sides and in front are slightly shorter. The full-grown larva is somewhat slug-like in appearance, and the maximum length is about one-quarter of an inch. If the mealy matter be brushed off, the body is seen to be elongately oval and of a dirty-creamy colour.

The mouth parts are of a specialised type, the various parts (mandibles, maxillæ, labium, and labrum) being formed into a piercing and sucking beak.

### **Adult Female.**

The adult female (Plate 50, Fig. 2) differs very little in external appearance from the oldest-stage larva. In fact, it is not possible to distinguish these two stages macroscopically. The well-developed legs are retained throughout life, while the antennæ, which in the young larva are composed of six joints, in the adult female are nine-jointed and fairly conspicuous.

The adult female does not die immediately after completing reproduction, and in some cases it has been observed to survive for a period of over two weeks after that time. As regards the time taken to complete the life cycle we have not very many records, but these show that the period is very long for this class of insect. The longest complete record

is that of one female which was born 20th February and began to produce young on 4th May—that is after seventy-three days. A number of others gave a period of sixty-five days or just over nine weeks. This was the minimum period observed, the average being 70.4 days. Our evidence goes to prove that the female does not feed after its young have begun to appear.

Each female is capable of giving birth to a large number of offspring, and in laboratory experiments the figures obtained show an average of approximately 250 per female.

It was also observed that the females are capable of reproducing without having first been fertilised by the male insect. It is not known how many generations can continue to reproduce parthenogenetically, but in laboratory work females produced in this manner gave rise to a second generation without having been fertilised.

### **Development of the Male.**

The male (Plate 50, Fig. 1) is in some respects strikingly different from the female. The larvæ which are destined to give rise to males are at first practically identical with those which produce the opposite sex. Apart from microscopical differences, the outstanding feature is that the male produces a distinct pupal or resting stage. This stage has not been found in the case of the females.

The male larva reaches a maximum length of about one-twelfth of an inch, and then remains stationary in this respect for a long time. Ultimately it covers itself with a compact mass of the usual floury secretion. From this time on the development differs considerably from that of the female. Soon two small wing-pads are developed on the mesothorax, and in the final stages the antennæ become much longer and the anal characters somewhat altered.

Unfortunately none of the males with completely known records actually emerged, so that the period of development is not known.

### **The Adult Male.**

From the pupa emerges the adult male—a delicate creature scarcely more than one thirty-second of an inch long. It possesses a single pair of fine gauzy wings which are usually folded flat on one another along the abdomen. These wings are a creamy white in colour and almost twice as long as the body, and so when the insect is at rest or crawling about the folded wings obscure the abdomen from sight. Two long white filaments, which are borne at the posterior end of the abdomen, project beyond the wing-tips and are very conspicuous. The antennæ are long, and, as a rule, are held close to the sides of the body. They consist of nine joints, the basal one being the smallest.

The adult males are difficult to obtain owing possibly to their minute size, and probably they are produced in much smaller numbers than the females. This last is concluded from systematic field observations and also from laboratory breeding work.

### **Allied Insects.**

Several members of the mealy bug group are known to affect grasses both in Australia and other countries. The study of our Australian

species is by no means complete, but several closely allied species have been recorded as associated with Australian-grown grasses. In 1912 an undetermined species of *Dactylopius* was recorded as attacking Rhodes grass in North Queensland. In 1921, W. W. Froggatt listed a species *Dactylopius herbicola* Maskell from *Aristida vagans* in New South Wales, and in 1927 another species of *Dactylopius* was found damaging *Paspalum* at Eumundi.

### Distribution.

As far as is known at present the species under discussion is confined to the Cooroy area, but it cannot be taken as definite that this is the limit of its distribution. In fact, that is by no means probable.

### Means of Control.

In dealing with the control of an insect, one of the primary considerations is the abundance or otherwise of natural enemies. At the time of the first outbreak of the mealy bug in 1926 a thorough search was made for its natural enemies. It was found that these were very scarce; in fact, in the patch of 10 acres systematically examined, less than half a dozen individuals were discovered. Those found were of two kinds—ladybirds of the species *Cryptolæmus montrouzieri* Mulsant, and a small chalcid wasp, *Leptomastix guttatipennis* Girault. Shortly afterwards a colony of about 150 of the *Cryptolæmus* ladybirds was liberated in the affected field.

In December, 1927, another examination for parasites was made, and this time the same two species were found in fairly large numbers, and undoubtedly doing much good in checking the mealy bug. In addition to these, two other chalcid wasps were found, but we have not been able to prove that they are parasitic on the mealy bug, though they are closely related to known coccid parasites.

In order that these two definitely useful insects may be recognised the following short descriptions are included.

### The Ladybird.

The ladybird, *C. montrouzieri* Muls., is one of the best known of our useful insects. Its good work is recognised not only in Australia but also in America, where its value is counted in hundreds of thousands of pounds per annum.

The adult beetle (Plate 50, Fig. 6) is elongately oval in shape, and is about one-fifth of an inch long by one-eighth of an inch broad. The general colour of the upper surface (dorsum) is black; the head, which is very small, the thorax, and the posterior tips of the wing covers (elytra) are salmon red. The entire upper surface is clothed with fine hairs. The under surface is coloured somewhat similarly, the head, abdomen, and prothorax being yellowish red, while the meso- and meta-thorax are blue-black.

The larvæ (Plate 50, Fig. 4) are flat, rather long-legged creatures of a brown colour. The younger larvæ are practically bare of secretion, but in older stages the body is covered by a white flocculent secretion, and in the half-grown stage it is difficult to separate them readily on general appearances from the larval stages of the mealy bug. In the

full-grown state they can be easily picked out, as the secretion of the ladybird is much more coarse and does not extend into the long delicate filaments characteristic of the mealy bug. The legs of the larvæ are rather dark in colour and can readily be observed. The larvæ move fairly quickly and can be seen wandering about or sucking the body of a mealy bug.

The pupæ (Plate 50, Fig. 5) are seldom found. They usually lie hidden close to the ground. In form they are oval and are covered with a fine floury secretion, the presence of which tends to mask the actual structure and appearance of the brown-coloured pupal case.

The eggs have not been found by us in the grass. They are usually laid on the bark of trees in a bunch of six to twelve or more. They are orange-coloured, elongate, and tapering to a point at both ends.

### **The Chalcid Wasp.**

*Leptomastix guttatipennis* Girault (Plate 50, Fig. 3) is a minute chalcid wasp. It has two pairs of wings, the hind pair being very delicate and transparent. The fore wings are a deep purplish black, with the extreme base almost transparent and with five clear spaces, three along the fore margin and one on the hind margin opposite the last clear space near the fore margin. The fifth clear spot is in the centre of the wing just outside the marginal spaces. The extreme tip is also clear. In addition to these there is a light spot placed on the fore margin midway between the last and second-last clear spots.

The body, which in the female measures just under one-twelfth of an inch, is of a general purplish colour. The head is brown. The insect moves in a peculiar jerky manner, with its wings either held flat along the abdomen or at an angle of about 45 deg. to the body, and its antennæ held erect in front.

### **Chemical Measures for the Control of the Pest.**

The insects draw all their food from beneath the epidermis of the plant by sucking up the sap with tubular mouth-parts. The sap thus being taken from the interior of the leaf or stem, it is obviously useless to attempt to control the pest by application of stomach poisons to the surface of the plant.

Destruction by the use of chemicals is therefore limited to the use of such substances as would kill by affecting the respiratory organs or by direct contact with the body.

The habits of the insect as outlined above and the manner of growth of the host plant would render effective application of contact insecticides an extremely difficult task, and the cost in time, labour, and chemicals would be very great.

### **General Considerations.**

In making recommendations we have given consideration not only to the mealy bug problem but also to the health of the pastures, inasmuch as this may be related to insect injury in general.

It has been recognised for a long time that generally the most important offset against insect attack is to maintain the plant in a

vigorous, free-growing condition. Anything which interferes with a good supply of food, or in any way prevents the roots or other organs from combining in their function of distributing food materials throughout the tissues, at once renders the plant more susceptible to the ravages of its insect enemies. Authorities on scale insects have pointed out that those insects in particular, with very few exceptions, seem to avoid a free-growing plant.

Of the factors predisposing to unhealthy conditions in plants, it will be agreed that bad drainage and unsuitable soil conditions are amongst the most important.

Pasture, while it is utilised to the utmost limit, in most cases is left absolutely unattended, and yet it is really a most important crop, supplying as it does all the milk, meat, &c., which the herd directly or indirectly produces. These facts do not seem to be recognised by Queensland dairy farmers generally, but in places where this aspect has been realised the attention consequently given to the pastures has been followed by results which have much more than repaid the farmers for their work.

While some grasses might be expected to retain a vigorous growth for many years, the manner of growth of *Paspalum* would hardly give that impression. It has a rather deep root-system and grows in clumps or bunches with numerous leaves near the ground but very few on the weak spreading stems. The normal habit of *Paspalum* growing in pasture lands is to form a thick matted clump which soon becomes root-bound. Under such conditions it is scarcely to be expected that the grass will continue to grow in very good health. Analyses of Cooroy soils have shown that the physical condition as indicated by the capillarity is poor. From that fact good drainage would not be expected, and yet the *Paspalum*, which has a tendency to become root-bound, is left untended for ten or more years growing in these soils. In all cases where the injury to the *Paspalum* was noted the pastures varied from ten to fifteen years in age, and had been given scarcely any attention since originally laid down. During this time there has been a continuous and practically unrelieved drain on the plant-food materials in the soil, the root system has gradually become less and less efficient, and the matted growth of the leaves has to a large degree prevented the sun's rays from penetrating to ground or more obscure aerial portions of the plant. These adverse conditions have undoubtedly led to a considerable reduction in the vigour of the *Paspalum*. The falling-off in the carrying capacity of the land which is often complained of in the district is one of the most noticeable effects. In the old undisturbed pastures it is obvious to even a casual observer that the grass is not in a healthy, free-growing condition. In general the fields present a yellowish appearance, and the response to favourable weather conditions is very disappointing.

The unhealthy state of the grass and the probable primary cause have now been pointed out, together with the fact that some insects, especially coccidæ, are partial to weakened plants. It is therefore recommended that the health of the pastures be given immediate attention.

With the object of determining the best method of renovating old *Paspalum* plots, the Agricultural Section of the Department has been carrying out certain experiments, and though the work has not yet been completed, the experimenter (Mr. C. S. Clydesdale) reports that "The

two plots established at Maleny and Cooroy go to prove that the ploughing up of old root-bound *Paspalum* pastures is undoubtedly the quickest way of giving them new life." As regards actual amount of grass produced, it may be of interest to know that at Maleny the average yield of air-dry grass per acre was 1.19 tons on unploughed ground and 2.78 tons on ploughed, while at Cooroy the proportions were 1.60 to 2.10 tons. Examination of the plot at Cooroy demonstrated that the ploughed area had a much more healthy appearance than the unploughed parts, and was quite free from mealy bug, though close to a badly affected field.

### **Recommendations.**

In the case of a field infested by the mealy bug, the best procedure is to burn off first and then plough. The ploughing need not be a very good one, the main purpose being to tear up the old root-bound clods and to expose the soil to the sun and air. By ploughing to a depth of 4 inches this should be fairly well accomplished.

This ploughing will also help to kill off the mealy bugs owing to their relatively long life cycle of nine or ten weeks. However, we strongly recommend that the ploughing should not be postponed until the mealy bug or some other insect asserts itself.

Probably the best method would be to work on a few acres at a time. This area could be protected if necessary by a temporary stake fence for the short period it will need to be left undisturbed.

It may be borne in mind that the insects appear to prefer the sunny and protected northern slopes, and it would be advisable, perhaps, to attend to these portions in the first instance. At all events such sites should be kept under observation for signs of damage as described above.

As regards the best time to plough, this is dependent on whether the mealy bug is present or not. If the insect be noticed on a small patch there is, of course, no point in waiting and thus allowing it to spread, especially if the grass can be burnt. In the case of larger areas already affected, burning and ploughing in the late winter or early spring should be followed by the best results. The farms in the Cooroy district are mostly on rather hilly country, and it will, of course, be necessary to give the ploughed ground time to settle down before the heavy summer rains commence.

If ploughing is being carried out simply for the renovation of an unaffected pasture, the time of the year is purely a matter for the farmer to decide on his own experience or that of an expert agriculturist.

### **Summary of Control Measures.**

The mealy bug is subject to the depredations of a number of natural enemies, and in normal circumstances these may be relied upon to prevent their host from assuming pest proportions.

Now, however, the unhealthy state of the *Paspalum* in the Cooroy district has rendered the coccid injurious to a high degree. We therefore recommend that the affected grass be first of all burned off to destroy, in part at least, any mealy bugs present, and that the health of the grass throughout the pastures be then restored by a cultural method outlined.

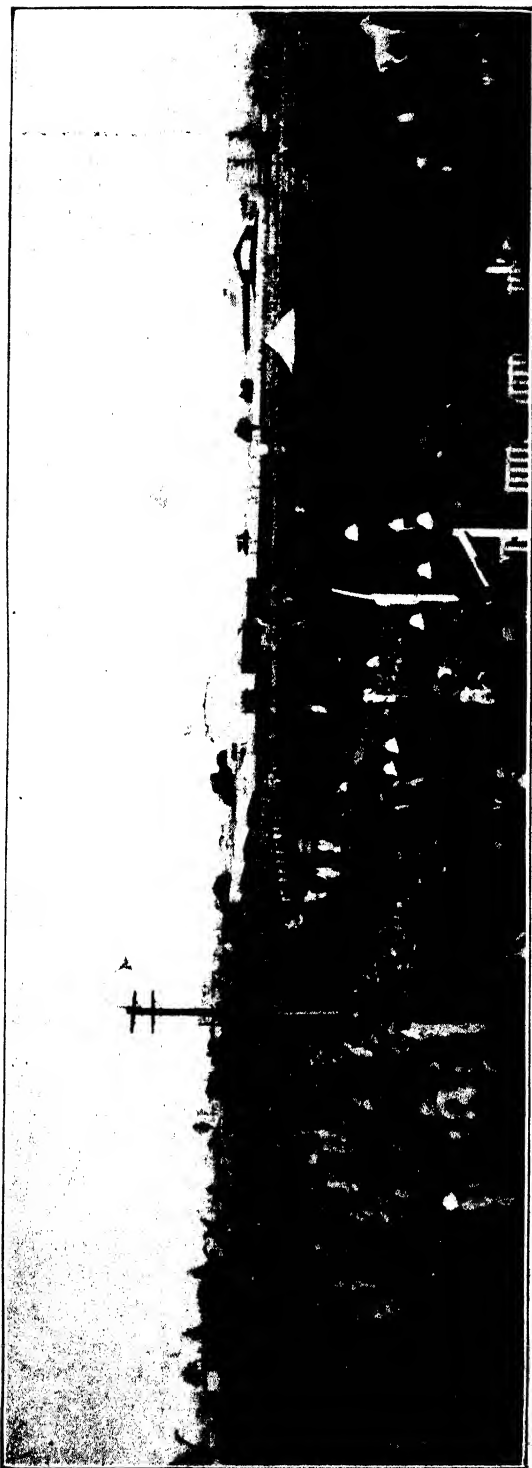


PLATE 51.—THE GRAND PARADE.

## ROYAL NATIONAL EXHIBITION.

QUEENSLAND'S BIGGEST AGRICULTURAL EVENT—AN INDEX TO INDUSTRY—A MIRROR OF THE STATE'S IMMENSE RESOURCES AND THE GREAT WORK OF OUR COUNTRY PEOPLE IN THEIR DEVELOPMENT—PRODUCTS OF RICH PROVINCES, OF FARM AND FIELD, OF SOIL AND TOIL, ESTABLISH HIGH STANDARDS OF HUSBANDRY AND DEMONSTRATE THE VALUE OF THE STATE'S CONTRIBUTION TO THE COMMONWEALTH IN REAL RURAL PROGRESS—THE MARCH OF MODERN SCIENCE AND ITS EFFECTIVE AND ECONOMIC APPLICATION TO AGRICULTURE—THE MECHANICAL ROAD TO PROSPERITY—EVERY EXHIBIT A PAGE IN QUEENSLAND'S HISTORY.

This year's Brisbane Show, held on the 6th August and following days, gave proof again of Queensland's rich endowment in climate and soil, and of her productive and recuperative capacity.

All our major, and most of our minor industries, were represented at Bowen Park, where, day after day, many scores of thousands saw, appreciated and appraised the extent to which Queensland depends on agriculture.

The huge daily crowds were distinguished by a general air of prosperity.

The Brisbane Exhibition is certainly a breeder of optimism as well as an exemplar of opulence. Each year the Show keeps on expanding. Each year it gives to us new lessons of hope on a background of accomplishment. Each year is recorded yet another notable advance.

The Royal National Association is a fountain of progressive ideas. It is a strong educational force, and no one will deny its importance as a factor in our agricultural progress. It stands for better stock, better farming, better business, and bigger returns to the man on the land, and all these points were emphasised again most strikingly at this year's Exhibition.

The Show presented impressive evidence of how town and country are linked in industry; how the application of sound principles work out in modern farming practice; how stock can be improved by selection, breeding, and feeding; of the extent to which agriculture is becoming mechanised; and how essential science is to husbandry.

**B** RILLIANT weather, with the exception of one wet day, favoured the Royal National Association for its 1928 Exhibition which was opened officially by His Excellency the Governor, Sir John Goodwin, on the 8th August, in the presence of a large crowd, which included many notable visitors from other States.

### A National Asset.

This year's Show was one of the most successful from every point of view. "It is a magnificent exhibition, and more than a Show. It is a national asset," declared the Governor, and in that opinion everyone present willingly shared.

The Court of the Department of Agriculture and Stock which, it is hoped, will one day be housed in a pavilion of its own, was once more the centre of agricultural interest. Other outstanding pavilion features were the display of the State Forestry Service; the comprehensive district exhibits; the one-farm efforts; the competitive entries in the agricultural produce section and the Rural and Technical Schools' array of examples of skilful and useful craftsmanship. Other noteworthy

displays were those of the Meat Industry Committee, the Agricultural High School and College, and, if it may be classed as an exhibit, the Farm Boys' Camp.

There was a suggestion of genius behind the idea of bringing a number of boys from different farming districts in the State, to the Show as the guests of the Royal National Association. They were accommodated on the grounds and everyone who saw them at work studying types and classes was impressed with the bright intelligence, exemplary conduct and keenness of these sons of farmers, who seemed one in the spirit of service and eager inquiry. Schools all over the country are teaching the farmers of the future the value of the use of scientific methods in every phase of farming. They are showing that those methods apply to stock breeding as well as grain production. They are showing that science points the way to independence, and these fine lads saw object lessons in everything they viewed in their tireless quest for information.

In the Departmental Court the value of science in the paddock as well as in the laboratory was demonstrated by State experts who know their job and the newest developments of it. The exhibits show what can be done, but the Departmental demonstrators are able to tell the farmer the best, cheapest, and quickest way of doing the work. Research results from official investigations into many forms of animal and plant diseases and pests were revealed. To the man on the land to-day it is evident that science is as essential as the plough and the harrow.

Out in the grassed arena the grand stock parade presented evidence that the Australian breeder knows and does what is best in animal husbandry. The cattle, both beef and dairy, were distinguished representatives of their respective breeds, and would command attention and win distinction in any show ring.

In the machinery section every exhibit was a pointer to prosperity along the modern mechanised route.

More and more is the Brisbane Show coming to be regarded as an index to Queensland industry. It is a powerful elevating influence concentrating on quality, and quality alone. It is a wonderful object lesson in the development of new types of stock and the elimination of inferior characteristics.

### **A Working Model of the State.**

The Show, too, might be described as a working model of the whole State. It was a demonstration of the fact that a nation must stand on two legs—secondary as well as primary industry—and it illustrated the inter-dependence of each. As the manufacturer is ready to learn from the producer of his raw material, so the farmer was out to learn something of the processes involved in transforming that material into the marketable commodity; he was out to learn something of industrial economies, business organisation, and commercial progress, and in all these things he saw how little, in these days, can be left to chance.

Interests have widened enormously in recent years and as an educational force the growth of the National Association and its activities must be even greater. Agricultural progress is, of course, its first and most important consideration. This is as it should be, but in its pageant of Queensland factory industries and the skill of Queensland workers in the John Reid Hall, the Association gave fitting recognition of the wisdom of bringing town and country together and proving industrially as well as personally their mutual reliance, as well as the essential inter-relationship of rural and urban production.

The cattle parade, as already suggested, provided the most obvious example of the Exhibition's educative value. In the ring and in the stalls the farmer was able to learn more about judging and selecting a beast than he would learn in a year of text-book study. There he saw the representatives of every breed up for judgment or the stockman's critical scrutiny. He saw the cow that would fill the bucket as well as the eye, and was able to appreciate the breeder's combination of cream-can value and show-ring beauty. In this the Show was a spur to enthusiasm, an incentive to balanced enterprise.

### **A Queensland Institution.**

There is another side to the Brisbane Show and that is its social value—the annual gathering of farmers from every district in the State's immense territory, men from the tropic north and "The Fruitful Granite" on Southern highlands yet white with winter's snows. From the western plains they also came to exchange a year's experiences and pool their knowledge and reach collective conclusions with settlers from the coastal jungles.

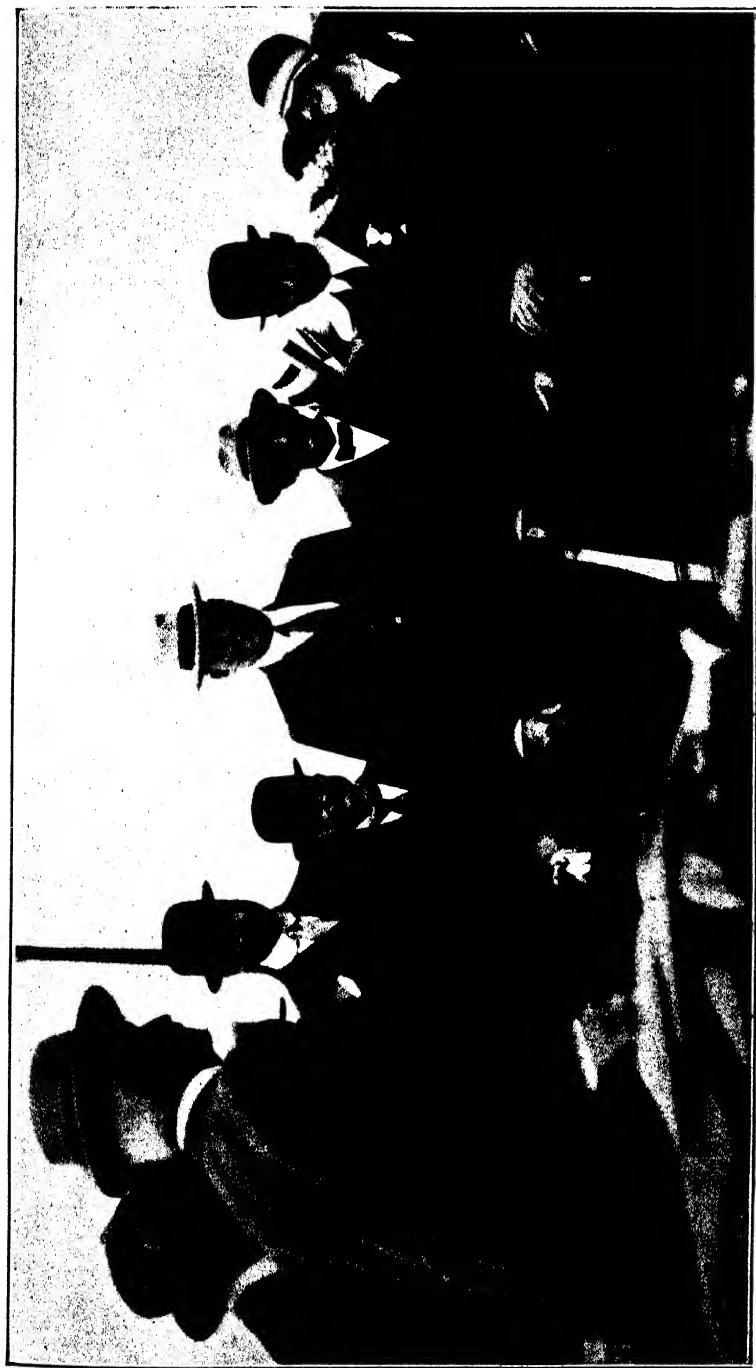


PLATE 52.—AT THE OPENING CEREMONY.

In the background, from left to right, are His Excellency the Governor, Sir John Goodwin; the Chief Justice, Hon. James Blair; the Premier, Hon. W. McCormack; the Minister of Agriculture and Stock, Hon. W. Forgan Smith; Mrs. James Blair; and His Excellency the Governor-General of Australia, Lord Stonehaven. In the foreground is the President of the Royal National Association, Mr. E. Baynes; next to him is Lady Goodwin. Others included in the group, but not caught by the camera, are the Prime Minister (Right Hon. S. M. Bruce) and Mrs. Bruce, Mrs. Forgan Smith, and the Leader of the State Opposition, Mr. Arthur Moore.

Thus the Brisbane Exhibition goes on from success to success, breaking yearly every previous attendance record. This Queensland institution, for it is nothing less, is one of the most impressive signs of our agricultural advance, one of the most encouraging indications to the farmer himself of how essential is his work to our national welfare. It represents the marvellous development of his industry not only in its range of interests, but also in its methods since the not far distant days when the first Queensland pioneers drove in their tent pegs on Oxley Creek, or turned the opening furrow below Bulimba Point.

It is, too, something more than encouragement the farmer gets, it is the inspiration that comes from the other man's success. He weighs and measures the reasons. He realises that the farmer who never conserves a ton of fodder is out of date. He accepts the evidence of the Exhibition, of his own eyes, that better bulls mean better herds and bigger returns. He appreciates the paradox that to stand still is to go back, that co-operation in industry—the co-operation of the producer with the manufacturer, the commodity board, the scientist, the engineer, and, not least of all, the consumer—of which the Show in itself is a simple demonstration, is the principle that when fully applied will lighten our common tasks, ensure our common good, and add enormously to our common wealth.

### THE OPENING CEREMONY.

**I** CAN say, frankly and unreservedly, taking this Show in a large sense, considering all the facts, all the exhibits, and all the conditions, it is my honest opinion that you could not have a more extensive, varied, and excellently managed Show in the whole world. I have seen many shows, and I have never seen, in any country, one which excelled or even equalled this."

The foregoing statement was made by His Excellency the Governor (Sir John Goodwin) in officially declaring the Exhibition open.

His Excellency thanked the President of the Royal National Association (Mr. Ernest Baynes) and the members of the Council for their kind words of welcome. He said it was a very great pleasure indeed for Lady Goodwin and himself to be there. They always visited the Show with the very keenest pleasure every year.

"I am delighted with all sections of the Show," said His Excellency. "There are magnificent cattle exhibits, both dairy and beef, and the agricultural products and fruit exhibits challenge comparison with any Show in the world. There are so many exhibits here which merit our unqualified admiration that it is impossible for me—and it would be invidious—to mention them specifically. The value of this Show, from an educational point of view, is inestimable."

His Excellency congratulated all those concerned on the magnificent results they had achieved. Much time, care, and devotion had been given to perfecting the Show in every detail. He was sure that the expenditure of time and money and energy would be repaid with enormous interest "in the future of this great State."

### The State's Continued Prosperity.

His Excellency the Governor and Lady Goodwin were welcomed by the President of the Royal Agricultural and Industrial Association (Mr. Ernest Baynes) on behalf of the council and members. Mr. Baynes also extended a welcome to His Excellency the Governor-General (Lord Stonehaven).

"It is pleasant to record the continued prosperity of the State as indicated by the phenomenal increase in the live stock sections, necessitating the provision of largely increased housing accommodation for sheep and dairy and beef cattle," said Mr. Baynes. "Including the district fruit and one-farm displays, we have no fewer than twenty district exhibits on view this year—a wonderful record. The exhibit of tropical and sub-tropical fruit shown by the fruit growers of the Blackall Range, the North Coast, and the Redlands is an eloquent indication of what our State is capable of producing, whilst displays made by one-farm exhibitors have never been surpassed either in Brisbane or in any other part of the Commonwealth."

"The machinery and motor car exhibits can best be described as superb," Mr. Baynes went on, "and they will undoubtedly prove of immense interest to visitors. The ring events promise to be very much more attractive than they have been for many years past, whilst the Meat Hall, with its lavish display of beef products, will prove a revelation to those who did not have an opportunity of inspecting it last year."

Included in the gathering besides the Governor of Queensland, Sir John Goodwin, and Lady Goodwin, were the Governor-General of Australia; the Governor of Victoria, Lord Somers; the Prime Minister of the Commonwealth, the Right Hon. S. M. Bruce and Mrs. Bruce; the Premier of Queensland, Hon. W. McCormack; the Deputy Premier and Minister of Agriculture and Stock, Hon. W. Forgan Smith and Mrs. Forgan Smith; the Leader of the Opposition, Mr. A. E. Moore; the Chief Justice, Hon. James Blair and Mrs. Blair; the President of the Royal National Association, Mr. Ernest Baynes and Mrs. Baynes; the Public Service Commissioner, Mr. J. D. Story; the Under Secretary for Agriculture and Stock, Mr. E. Graham and Mrs. Graham; the Assistant Under Secretary, Mr. Robert Wilson; the Director of Agriculture, Mr. H. C. Quodling; the Director of the Bureau of Sugar Experiment Stations, Mr. H. T. Easterby; the Chief Inspector of Stock, Major A. H. Cory; the Director of Fruit Culture, Mr. George Williams; the Chief Supervisor of Dairying, Mr. C. McGrath; the Agricultural Chemist, Mr. J. C. Brünnich; the Government Entomologist, Mr. Robert Veitch; Mr. W. A. Affleck; and the Secretary of the Royal National Association, Mr. J. Bau.

## OFFICIAL LUNCHEON.

### INSPIRING ADDRESSES.

At the annual luncheon which followed the official opening ceremony, inspiring addresses were delivered by the Governor-General (Lord Stonehaven), the Governor (Sir John Goodwin), the Prime Minister (Mr. S. M. Bruce), and the Premier (Mr. W. McCormack). The dominant note of the speeches was the immense educational value of this year's show, all the speakers expressing the view that its effects would be far-reaching and of incalculable benefit in making for greater efficiency in production. Many Federal and State members of Parliament, and members of the Royal National Association, were included in the distinguished assemblage.

### The Spirit of Sportsmanship.

Lord Stonehaven said that the most important people were the exhibitors, and he was glad to think that the real sense of true sportsmanship was as great as it was. It was impossible, by looking at them, to find out whether they were winners or losers. That was an immense national asset. All the exhibitors were entitled to congratulation, not merely those who were taking prizes home and sharing their satisfaction with their neighbours in the district they came from, but also those who would not take any prizes, but would take home a determination to bring back prizes next year. All were entitled to congratulation, because they were supporting that splendid national movement which centred in the Show opened that day in Brisbane. Then they had Mr. Baynes and his colleagues on the Royal National Council. No words could adequately express the service which they rendered to the community by organising that splendid show. (Applause.) He was sure they must be satisfied, for this year at any rate—not satisfied for good and all because he thought they were the kind of people who would never be satisfied—with the splendid progress the Show had made. Then they came to the Premier, who must be proud of seeing so splendid a display of the products of his State, and so splendid a demonstration of the ability and determination of the people, for whom he was the elected leader, to get the utmost value out of their splendid inheritance.

### Signs of Progress and Prosperity.

"When you come to the Prime Minister," added His Excellency, "he looks at it from the point of view of one of the six States of the Commonwealth for whom he is entitled to speak in the Councils of the Empire as a whole, and I am sure it must be to him an immense satisfaction to register the progress evidenced by the Show. Then come the Governor of the State and myself, who look at the Show manifestly from a rather more distant point of view. The Governor's horizon is bounded by the limits of Queensland. Last, and least of all, I come to myself, and I look at it from the point of view of one who is concerned perhaps primarily with Imperial questions, and going round, as it is my duty, privilege, and pleasure to do, to the different States, it is most gratifying to register, day after day, and year after year, signs of progress and prosperity of which this Show is such a splendid example. The Governor and I share one thing in common. We are both entitled by a Show such as this to report to the King a message that will gratify him. First of all, the abiding loyalty of the people of Queensland—(applause)—and secondly of the splendid way in which they are developing the magnificent resources of the State."

### The Show as a Stage.

His Excellency went on to say that he regarded the number of exhibits (7,328) as a wonderful performance, but numbers without quality would not give a fair indication of the products and possibilities of the country. Both in quality and in number he thought they were entitled to be thoroughly proud of the picture that the Show presented. He looked upon the Show as a stage, because, though from the point of view of the organisation, it was an end in itself, yet it was not really an end. Looking at a review of the past gave them confidence that the future would produce, as a necessary corollary, and an extension of the Show, a constant stream of products from Queensland; first of all, in the great markets of the capital cities of the Commonwealth, where they would find a ready and greater number of customers directly they could provide them, and, above all, in the great market of the Empire in London. How great that market was, he thought, was not sufficiently or not thoroughly realised. When it was realised that Britain imported 2,000,000 tons of sugar a year, and that less than one-half of that came within the Empire, yet in Queensland they had got undoubtedly the best sugar growing country in the world,

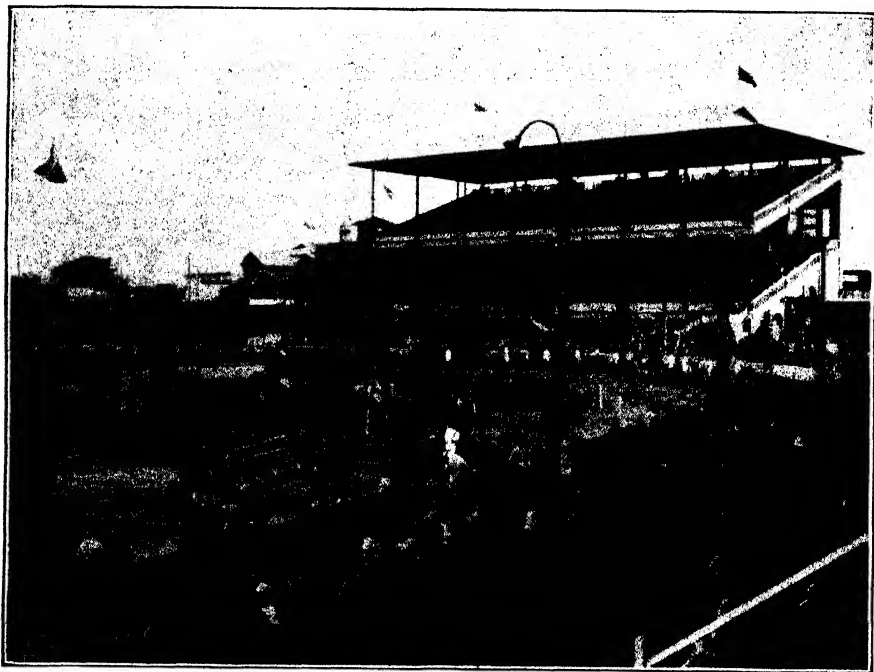


PLATE 53.—THE RING AND PART OF THE CROWD.

The Brisbane Show is one of the big social events in Queensland's year.

he knew at once, that they had in their minds the difficulties which might keep them out of the market at home at present; but he asked them to think of the difficulties which they in the old country were confronted with in facilitating Queensland's entry into that market. Difficulties only existed to be overcome.

### Keeping Business within the Family.

"If you know that you have got that market," continued His Excellency, "and, remember, it is not only the richest and best market in the world, but generous to its customers, you will appreciate its value. You will find there men of your own kith and kin. From two points of view they would prefer to buy what they cannot produce themselves from the Empire, rather than outside. I think you can look forward to the future with confidence. Firstly, we want to keep whatever business we have got within the family; and, secondly, from a purely business point of view, we would sooner buy from the people who buy from us, than buy from people whose purchases in our market are very small. (Applause.) Taking

also the market of fruit: Only one half of the fresh, dried, and canned fruit that we import comes from the Empire. This is another big field. Then, there is the question of butter, bacon, and cheese. From States bordering on the Baltic we imported last year £30,000,000 worth. You may say, 'What are your farmers doing to allow that state of things?' I suppose the farmers in the old country were doing, and are doing, exactly the same as you are doing in this country. They have not yet discovered the proper means of taking advantage of the market which lies within their gates. Once organised to take advantage of it, I am firmly convinced that when you tackle this problem you are going to solve it. I am getting on in years, yet I have every hope of living long enough to see our markets in the old country predominantly served either by home supplies or by those from other parts of the Empire. (Applause.)

"From that point of view this show of yours is a most encouraging experience.

### **Progress Every Year.**

"You see progress every year. Last year I remember being tremendously struck with your meat exhibit. This year the meat exhibit really is, I suppose, 500 per cent. better, and it is something that should be widely known and appreciated. I was struck last year by the class of juvenile judges, and you have extended that admirable principle by your camp for farm boys. It is really an admirable and excellent idea. (Applause.) In the meantime, you have provided for the holding of your exhibition under the best possible conditions, by wise spending a large sum in extending your buildings and improving facilities, and you have a very generous lot of prizes—£9,000 in money and £1,000 in trophies. That is splendid work, and I hope that I can make you realise how it appeals to us in the old country."

### **Building up Australia.**

In conclusion, His Excellency said that it was a great privilege to play any part, however small, in the great development that has taken place in this part of the Commonwealth, because by building up Queensland they were building up Australia, and by building up Australia they were building up the Empire. No man and no woman ever had a greater birthright than that of being a citizen of the Empire, because the Empire stood for all that was best in human life. Education was the main element in enabling people to form a right judgment, and by the great part the exhibition played in the work of education it was rendering great service, both directly and indirectly, to themselves and the Empire, which could not be exaggerated. (Applause.)

### **An Extraordinarily Impressive Show.**

In proposing the toast of the State Governor (Sir John Goodwin), Mr. Baynes said that during the short time His Excellency had been in Queensland he had travelled extensively, and had become acquainted with citizens throughout the State. His Excellency had done his best to become closely acquainted with the people on the land and in industries, and by his kind sympathy to those who were having rather a bad time in the drought area he had endeared himself to all. (Applause.) He did not know anybody who had a greater admiration for the men and the women in the back-blocks than Sir John Goodwin. (Applause.)

His Excellency, in reply, said that the Show this year was an extraordinarily impressive one, and, excellent though it was last year, yet one noticed with pleasure and admiration the many marked improvements which had taken place, not only in the general arrangements at the Show Grounds, but also in the increased number and improved quality of many of the exhibits. Some wise man once said "inaction means deterioration," and that was absolutely true. One could not stand still, and there was certainly no sign of lethargy in the Royal National Agricultural and Industrial Association of Queensland; it steadily advanced from success to even greater success. The cattle exhibits—both beef and dairy—appeared to him to be of an extremely high standard, while he understood that the total entries for all exhibits in the Show numbered more than 7,000.

### **A Tribute to the National Association.**

"Personally," added His Excellency, "I say frankly, and without hesitation, that I have never in my life seen a Show which has been better organised or managed, nor one which has shown such an amazing variety of exhibits of the very highest quality."

"I think that it would be invidious were I to mention any particular exhibitor or exhibit, much as I have admired many of them, but I should like to emphasise two points. Firstly, as regards such exhibits as the district and one-farm sections. These appear to me to be of immense importance and value, not only from the view of promoting healthy rivalry, but also as showing to the people of the cities in an attractive form the amazing resources and products of the country districts of the State. I realise the immense amount of work, time, and expense involved in staging such exhibits, but when looking at them I have felt strongly that the men and women who have done the work, even if they have not been successful in gaining awards, have nevertheless performed a great service to the State of Queensland, and are big-hearted, right-minded citizens."

### **An Educative Force.**

In conclusion, His Excellency added: "Now, I should like to say a few words on a subject in which I take a very great interest, and which I believe to be of immense importance as regards the future of Queensland, and that is education. This Show is far more than solely an exhibition of stock, agricultural, and industrial products, important though these are; it is an educational factor which is of inestimable value. The farm boys' camp which has been instituted this year, the attendance of the



PLATE 54.—MR. BRUCE WAS THINKING SERIOUSLY OF QUEENSLAND AS THE QUEEN STATE OF THE COMMON-WEALTH.

students from Gatton College, and undergraduates from the University, the young judges' competition, the school competitions, and many other factors, bear striking evidence as to what this association is doing as regards education, and I should like to mention the splendid schools' exhibit, which has been organised by the Education Department. When one goes round this Show and sees the magnificent live stock, the agricultural produce, the secondary industries in the John Reid Hall, the forestry and meat exhibits, and when one also considers the care and attention which are being so wisely directed towards the education of the rising generation, one cannot but feel that, great as Queensland is, she has an even greater future ahead."

### **Raising the Standard of Efficiency.**

The Prime Minister (Mr. Bruce) said it was a great satisfaction to him to be permitted to attend for the second time this Exhibition. He always liked attending Agricultural Shows, because he felt that there was a great bond of sympathy between those who had the management of them and himself. They were both attempting to do the same job, and that was to raise the standard of efficiency in Australia.

### Building up Australian Sentiment.

The Queensland Show served two great ends—one was that it was a stimulation to increased efficiency, and the other that it brought to the dweller in the city a greater knowledge of the possibilities and resources of this State.

What was required was a greater recognition of those resources, and greater optimism. Every one had the idea that the Australians were an optimistic people. He did not agree with that view. We were not sufficiently optimistic about our own country. We were not prepared to tell everybody in the world that Australia was the greatest country of the earth, and that the State of Queensland was the greatest of them all. However, we were gradually building up in Australia that spirit to some extent. He could instance the State of Western Australia, which he recently visited. When he went there for the first time, five and a-half years ago, the people spoke continuously of their troubles, and cursed the Government both of the State and the Commonwealth. They also cursed the tariff, the Navigation Act, and everything in the land. But five and a-half years had gone by, and on his recent visit to Western Australia he found that the people had forgotten all these troubles because they were so busy in telling everyone that Western Australia was the greatest State in Australia,



PLATE 55.—THE CROWD WAS INTENSELY INTERESTED IN THE GRAND STOCK PARADE.

A section of the immense daily gathering on "Machinery Hill."

that there was no limit to the wheat she could produce; in fact, that she would in the future be able to produce more wheat than the whole of the rest of Australia put together. They declared that it was only a matter of time when they would have a population as great as all the other States combined. He had a sneaking belief that Western Australia was quite right, and that some day she would be the greatest State; but unquestionably Queensland was the State with the greatest possibilities of the whole Commonwealth to-day.

### The Spirit of Optimism.

They wanted that spirit of optimism to prevail throughout Australia. He had such a belief in Australia that he considered it was highly necessary to advertise its potentialities. Once having seen the country, they could not fail to realise that it was the greatest country in the world.

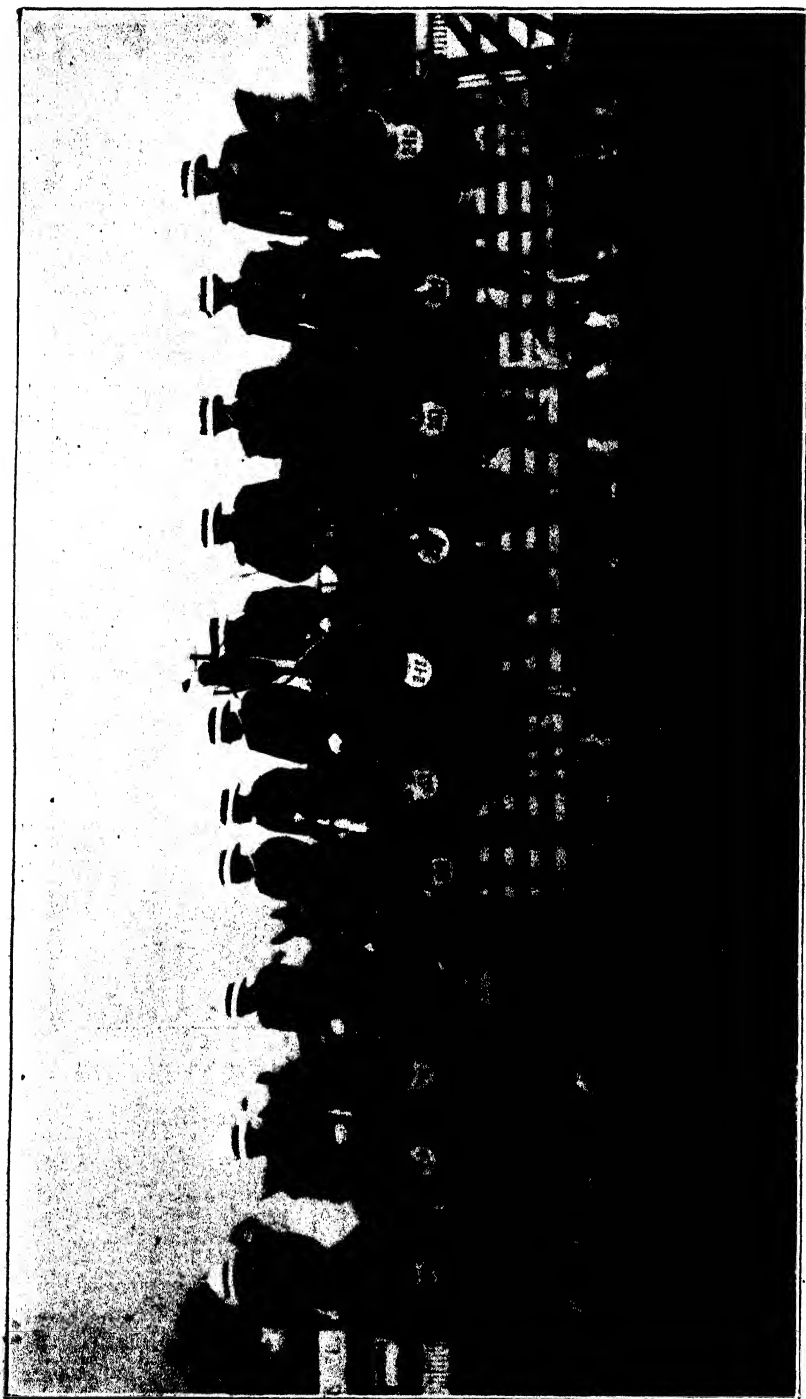


PLATE 56.—TROOP OF MAGNIFICENT REMOUNTS.

The Queensland Mounted Police is noted for its all-round smartness, efficiency, and expert horsemanship. These horses were bred on the Government Remount Station in the Central District. The Police competition was a very popular ring feature.

Another great object that this Show would achieve was in demonstrating that the greatest requirements in Australia to-day were to improve efficiency of production and the marketing of its produce. That was the solution of the problems that faced Australia to-day. Australia had tremendous difficulties. The greatest of them was the fact that the expanding production had become too great for the home market to absorb. They therefore had to go into the markets of the world and compete with other countries. Many people declared that this could not be done successfully. They started to talk about the tariff, and said that it was such a deterrent to the producer that it would be impossible to compete on the markets of the world. There might be something in that, but we could concentrate on getting the tariff on to a scientific basis by which the producer would be placed in an advantageous position.

### **Efficiency in Production.**

"It is not the tariff, nor the policy of any Government that prevents us to-day," said Mr. Bruce, "from competing in the markets of the world. It is the need for greater efficiency in production. Your Show is doing a great deal to educate the people of Queensland to achieve that efficiency.

"I have been told that the way in which we can solve all the problems of our export trade is by reducing wages in Australia. The amount we can save by doing that is incomparably small compared to what we can accomplish by improving efficiency and bringing it up to the standard on which it should be. That can be done in Australia. Hitherto we have never taken the trouble to increase efficiency. Things have been too easy. We have had too fertile a land and too wonderful a climate. Now, when we have grown to manhood, and have to seek our markets in competition with the rest of the world, we have to abandon that atmosphere of not worrying very much, and we have to rely upon our efficiency. We have to recognise that we have greater advantages than any other country. There is no body which is doing more to help in that than the Royal National Association of Queensland, and I would like to pay my tribute of admiration to them for what they have achieved."

Mr. Bruce went on to say that the present year was memorable in regard to the advancement of science in our primary industries, which were the basis of our national development and prosperity. During the present year they had received a visit from three distinguished scientists. One was Dr. Orr, the head of the Royal Institute of Aberdeen, who was noted as an expert on the subject of animal nutrition. They had also had a visit from Sir Arnold Theiler, who would be the head of the Animal Health Bureau, which was being established in Britain as a result of last year's Agricultural Conference. They had also had a visit from Sir John Russell, who was probably the world's greatest expert with regard to soil and fertilisers. These three men had seen this country, and each one had expressed the opinion that Australia had the greatest opportunities from a pastoral and agricultural point of view of any country in the world.

### **A Tribute to the Queensland Government.**

Mr. J. P. Bottomley (hon. treasurer of the Royal National Association of Queensland), in proposing the toast of "The State Parliament," coupled with it the name of the Premier (Mr. W. McCormack). On behalf of the association, he expressed his thanks to the Premier for the assistance that the Government had rendered during the past few years, which had enabled the association to effect so many improvements. He appreciated the action of the Minister for Education (Mr. T. Wilson) in arranging for his department to stage such a wonderful exhibit, which clearly showed what the educational system in Queensland embraced.

Mr. McCormack, in responding, congratulated the president of the association and his council upon the very fine Exhibition this year. It was an interesting Exhibition, and should prove a great enlightenment to the people who had come here from the Southern States. He took this opportunity of telling those visitors that Queensland was not the kind of State they were inclined to believe it to be. They heard a good deal of criticism from the people in the Southern part of Australia, and he agreed with the Prime Minister that they should boost their State more in the South than they were doing. They should not allow the Southern criticism of Queensland, which could produce almost every commodity that man required, to pass unobserved. This Exhibition possessed a very fine educational value, and no doubt compared favourably with similar shows in other States and other countries. Queensland was not a very old State, and it had not the huge population possessed by other countries. It had not even a population as great as New South Wales or Victoria. It had a wider area, and more difficult problems to meet in regard to transport and climatic conditions, yet in spite of these difficulties they were able to produce a magnificent Exhibition such as this.

**Embargo on Queensland Meat.**

"There is another aspect," continued Mr. McCormack, "that we must remember, and which we want to impress upon the Southern people. We can produce many things that they require, and they can manufacture many things that we require; but we find that in some States there is a decided objection to giving us the opportunities that we should possess of selling our primary products in those Southern markets. In the course of the last month I have been endeavouring to help a match manufacturing industry in Victoria to get the trade in Queensland, instead of allowing that trade to go to Sweden. The Victorian company can produce an article of equal value, and at the same price, as the imported article. This is not a matter that requires tariff intervention. It requires the sympathy of our own people, who should show a preference for goods made in Australia. On the other hand, unfortunately, the State of Victoria, from which we are getting this article, is putting an embargo on the meat which we should produce and sell in the Southern States. I hope those Southern visitors who are here to-day, whether they be in high positions of State or



PLATE 57.—IT WAS A GOOD STORY.

Mr. Forgan Smith, Lord Stonehaven, and Mrs. Blair,  
reflect the spirit of Australia.

citizens who are visiting our Show, will do everything they can to bring closer together the peoples of our Commonwealth States, so that we may sell to the Southern States the things that we produce, and take from them the manufactured articles that we need."

**Queensland Industries.**

Mr. McCormack, continuing, said that he believed the Brisbane Show furnished the finest opportunity to exhibit to the people, not only of this State but also of the Southern States, the industries upon which this State relied. It also showed them what Queensland could do in primary production, and it gave to the world at large an idea that Queensland was quite as forward as other countries in the world.

Mr. McCormack concluded by saying that the whole of the Queensland Parliament—and he thought he could speak for all parties—were anxious to assist those men who had given their time and money to make this Show such a great success. (Applause.)

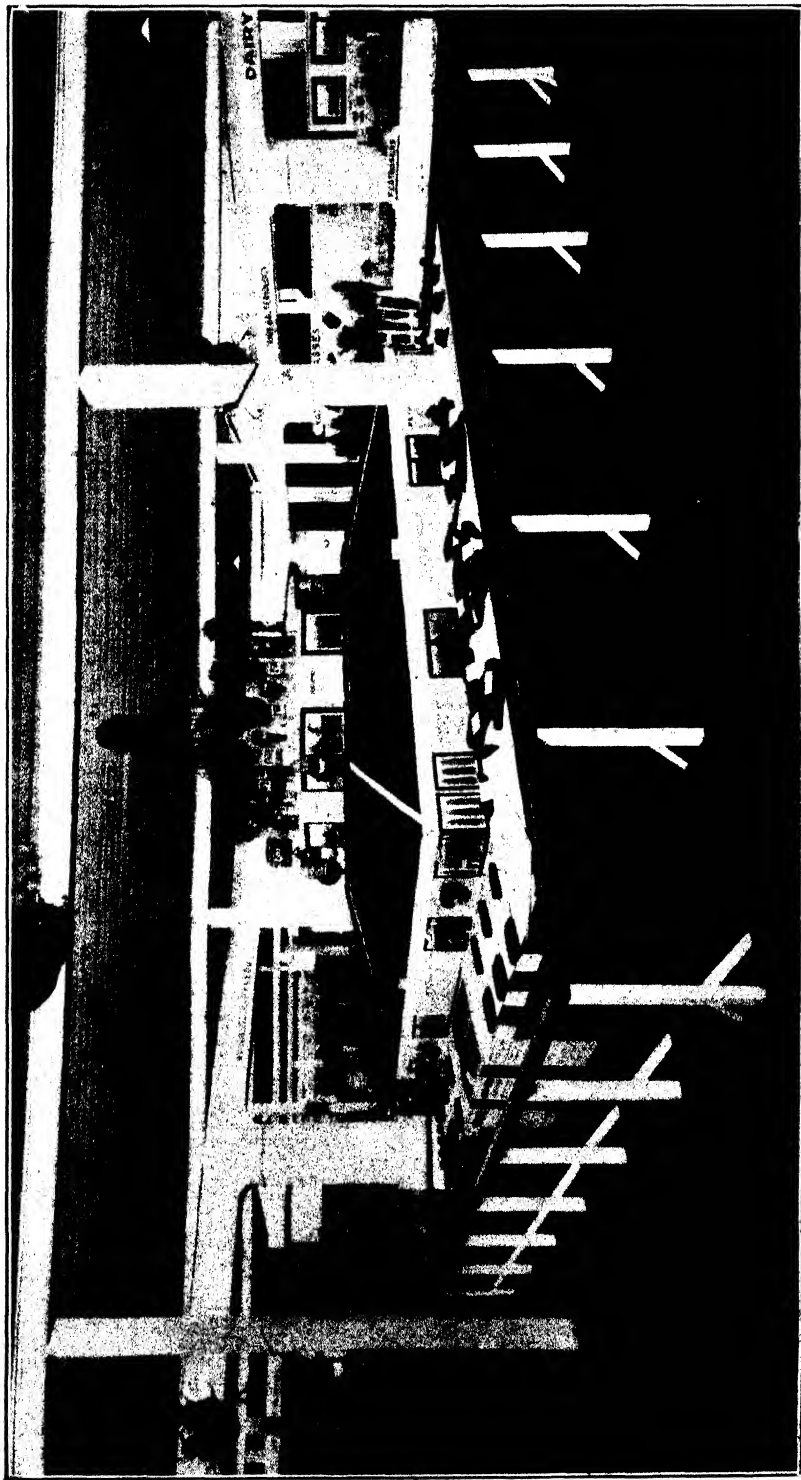


PLATE 58.—MAIZE WAS ONCE MORE KING.

The Central Trophy in the Departmental Court illustrating the practical results in Grain Improvement achieved by Departmental Plant Breeders.

## THE COURT OF AGRICULTURE.

### REPRESENTATION AND REVIEW OF DEPARTMENTAL ACTIVITIES.

The Department of Agriculture and Stock was represented this year in its Court in the Exhibition Pavilion by a well-organised and artistic display, educational in aim, designed to represent the work of a number of field and technical officers, and to serve to illustrate by the meticulous care taken in the arrangement and technique of the exhibits that a high standard of departmental efficiency has been reached in dealing with the many and varied problems of primary production. A country's progress in agriculture and stock raising is dependent now more than ever on the linking of science with practice. Proof of the soundness of this assertion was observed throughout every section in the Departmental Court. These sections embraced a varietal display of sugar-cane; maize breeding and seed selection; a wheat exhibit; broom millet and sorghums; separate wool and cotton displays; native grasses; weeds and suspected poisonous plants; an entomological exhibit; vegetable pathology; a dairying exhibit; the work of the Yeerongpilly Stock Experiment Station and of the Pure Seeds Branch; pig raising and poultry exhibits; a varietal display of Townsville-grown potatoes, and a similar class of exhibit of cassava grown in the Mackay district; and "Queensland Agricultural Journal" Information Bureau.

### CEREAL CROPS—NEW TYPES EVOLVED.

#### Maize

A pyramidal trophy of maize, which thrives in Queensland practically from the Tweed to Cape York, was the central feature of the Court of Agriculture, and illustrated definitely the fact that the solution for market gluts and low prices is largely a greater utilisation of the grain for stock feeding and for manufacturing purposes, lines of development on which America commercialises upwards of 3,000,000,000 bushels per annum. Mounted on this trophy was a wide range of educational texts, describing concisely and clearly the maize improvement project, one of the many branches of Departmental field work administered by the Director of Agriculture, Mr. H. C. Quodling.

Evidence of the successful application of scientifically designed seed selection and of the work of Mr. C. McKeon, Assistant Instructor in Agriculture, who specialises in this branch, was observed in the wide range of samples staged. Several varieties of yellow maize, the subject of the improvement work, were shown, and it would be difficult to visualise a greater perfection than that attained in the samples set out as they were in juxtaposition to a wealth of information of undoubted educational value. The significance of this seed improvement work and of its practical application was readily appraised by the type, character, and productivity of the several varieties shown, prominent among which was the more recently evolved Departmental "Durum" variety, especially bred and developed to meet the requirements of the Atherton Tableland, where a hard, mould-resistant type of grain is necessary. In this particular district seed maize is being grown on an isolated area under Departmental control, and progressive plans have been formed for the early distribution of seed supplies for the express purpose of rapidly bringing "Durum" maize into general cultivation. The samples shown indicated a rather extraordinary bushel weight, up to 62 lb. as against the usual standard of 56 lb., the grain being bright amber yellow, hard, sound, and attractive in appearance.

Trade prejudice by interstate and oversea buyers against red corn has recently been observed, and growers would be well advised to plant strictly yellow varieties in lieu of red or red-tinted maize, otherwise similar difficulties in effecting sales will have to be met next year.

#### Wheat.

This comprehensive display occupied the full width, about 70 feet, of the top of the Court, and its arrangement, which was in the hands of two officers of the Field Branch, Mr. C. S. Clydesdale, Assistant Instructor in Agriculture, and Mr. S. Smith, Field Assistant, was designed to illustrate the increasing popularity of the crop as a complement of two other staple industries—sheep raising and dairying. Last year approximately 4,000,000 bushels were harvested in Queensland, and phenomenal yields were obtained over the larger portion of the Darling Downs. Many crops ranged from 40 to 50 bushels an acre, the record yield being 66½ bushels, which was harvested near Allora. As no fertilisers were used, the results serve to demonstrate the inherent richness of Darling Downs soils. Prominence was given to contributory factors in maintaining high productivity, and an educational presentation of these was set in sequence on placards on which the underlying principles of cultivation

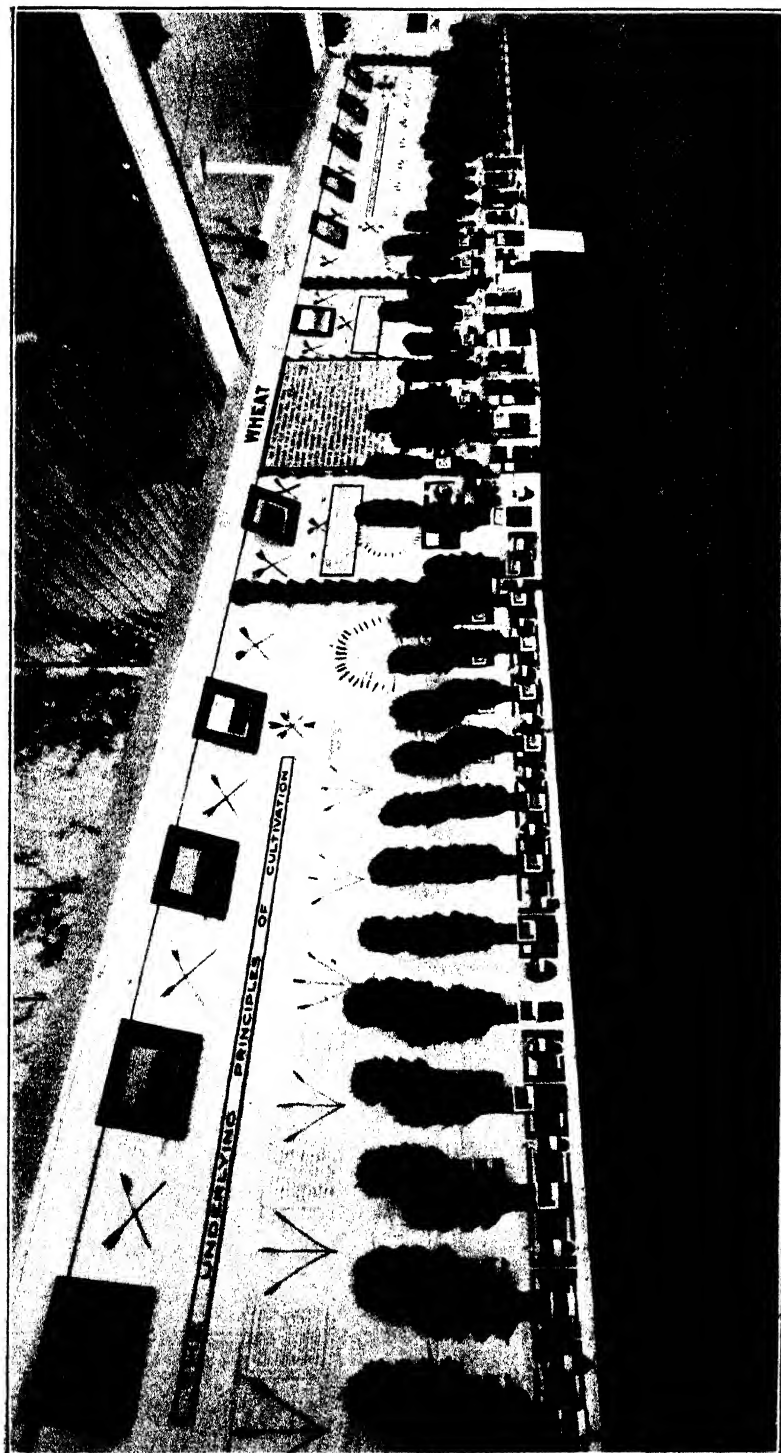


PLATE 59.—WHEAT WAS ONE OF THE STRONGEST FEATURES OF THE DEPARTMENTAL COURT.  
 Through systematic breeding the Department has evolved prolific wheats suitable to Queensland conditions of, mainly, summer rainfall.  
 This work has been a most important factor in quadrupling our grain yield.  
 “Mountain or river or shining star,  
 Away to the skyline stretching far—  
 A sea of ripening wheat,”  
 There’s never a sight can beat—

and soil moisture conservation were tersely described. Experience has shown that, although the annual rainfall in the Queensland wheat belt is higher in the aggregate than that in parts of the Southern States where, contrary to a crop each season here, a year's fallowing may precede the planting, there is an ever-present necessity in Queensland for an improvement in farming practice by the more systematic preparation of land to absorb and conserve the summer rainfall which must be stored and held in the subsoil.

Another very important feature of the wheat exhibit was the display of new varieties bred at the Roma State Farm, which were subsequently grown in different districts under the supervision of officers of the field staff. Upwards of fifty selected strains in sheaf and grain were exhibited; these were from plots at Jandowae, in the Dalby district. By a continuity of this experiment and observation work, progressive field demonstration plots are carried on, the more highly rust-resistant and productive varieties being tested out under field conditions. Selected varieties are gradually brought into cultivation, this work being linked up with that of the Wheat Board.

Photographs of the Departmental classification scheme were shown, giving information as to the character of grain, time of maturity, and the suitability of different varieties for different soils and districts, all with a view of affording information to growers in concise form.

Last year one of the new Departmental wheats, "Duke of York," a Bunge-Gluyas-Cretan combination, returned 77.25 bushels for each bushel sown on a small field, grown and harvested under field conditions.

The 1927-28 Field Crop Competition was illustrated by a series of photographs of the fifty-one competing crops, and reference was made also to the district prizes won and the Royal National Championships, the judging of the crops having been entrusted to the Department.

Many other features of interest were included in a display which provided an excellent advertisement of the potentialities of this great State.

## OTHER PRODUCTS.

### Broom Millet and Sorghums.

Grouped in the form of a wall and bench display were a number of samples of broom millet and Nigerian sorghums. The former has attracted much attention in the last few seasons, and is now marketed under the Pool system. Evidence has not been wanting of some laxity on the part of growers in the classification and preparation of this useful household commodity. Much text information was also given on the growing and marketing of this crop.

The sorghum samples shown were grown in Departmental plots in Central Queensland under the District Agricultural Instructor, Mr. G. B. Brooks, who is engaged in testing and seed selection work with the more recently imported varieties, which made extraordinary growth under the forcing conditions met with in the recent wet season. This group belongs to the non-saccharine class, and on this account the fodder is inclined to be pithy. The grain, however, is large, and in suitable situations the crop should prove an acquisition for a variety of purposes.

Saccharine sorghums forming the subject of comparative fertiliser trials at Yeerongpilly, conducted by the Instructor in Agriculture for Southern Queensland, Mr. A. E. Gibson, afforded proof of the very high fodder yields obtainable in a favourable season, and illustrated also the economic value of saccaline as a green fodder and ensilage crop. Planted on 10th October last year, the crop was cut and weighed on the 21st and 22nd December, representing growth made in two months and a few days; the highest aggregate return from one of several plots was 35 tons 9 cwt. 15 lb. per acre. In a ratoon cutting from the same plot on 28th March this year a yield of 30 tons 14 cwt. 1 lb. was obtained, or an aggregate yield of 66 tons 3 cwt. 16 lb. per acre.

### Cassava.

At the Royal National Show in 1926 and 1927 a special feature was made of this crop in connection with the production of power alcohol, the Department having introduced 1,000,000 cuttings from Java for planting out in the Mackay district, principally at Sarina. The wet season militated generally against the success of the crop. Experiment work is still in progress. Samples of a few of the varieties of cassava taken from the Departmental experiment plots were on exhibition, with an accompanying record of yields which indicated that the plant is capable of high returns. Up to the present there is not sufficient data to determine whether cassava can be grown at a profit for the extraction of power alcohol.

### Northern-Grown English Potatoes.

An important section of the experimental work dealt with by the Northern Instructor in Agriculture, Mr. N. A. R. Pollock, is that of demonstrating the best and most suitable varieties of potatoes as a food crop for the North. The special features associated with the production of thirty-six varieties on Mr. A. W. Hughes's farm, in the Townsville district, were set out.

To the Southerner potato-growing is not usually associated with the tropics, yet the quality of the tubers exhibited and the yields obtained, up to 8½ tons per acre, compare more than favourably with the production of temperate regions.



PLATE 60.—FODDER CROPS WERE STRONGLY FEATURED IN THE DEPARTMENTAL DISPLAY,

And panels like this gave point to the aphorism that half the breeding of a beast goes down its neck.

The Department, in an effort to popularise potato-growing in the North, has conducted trials on the Tableland in the summer and in the coastal districts in the winter months for several years with such marked success that the area under crop in these localities has shown so substantial an increase each succeeding year as to permit of a forecast in the near future that production will be sufficient to supply all Northern requirements. With summer crops on altitudes of 2,000 feet and upwards and crops on lower coastal altitudes during the cooler parts of the year, the market should be well supplied.

Growers on the tropical coast experience a difficulty in securing seed sufficiently forward for planting towards the end of March, which is considered the earliest period for safe planting, seed from the Tableland crops rarely being fit until late April or May.

The crop, of which the samples shown were representative, was grown from seed produced on the coastal areas of the North last year, being harvested in September, held in Townsville until the first week in November, when it was placed in cold storage at a temperature between 34 and 40 degrees Fahrenheit until the 23rd March, and planted on the 2nd of April with a resultant strike of 100 per cent.



PLATE 61.—SAMPLES OF QUEENSLAND'S PASTURES PANELLED IN THE AGRICULTURAL COURT.

The value of Wool alone exported from Australia over a five-year term approaches £300,000,000, and practically all this wealth was derived primarily from indigenous grasses and edible herbage.

The success attendant on the cold storage of this seed suggests an equally favourable result in a similar treatment of commercial lots, whereby a glut in the market may be obviated and prices kept within reasonable bounds.

Interspersed with the Potato varieties were printed cards containing notes on potato culture, precautions to be taken against damage from disease, and formulæ of standard fungicidal and insecticidal sprays.

The display with the different colours of the many varieties of tubers, each with an identification card, not only formed an attractive picture, but with the information made available afforded one of those educative efforts in the whole Court.

### Queensland's Wealth in Natural Pastures.

An exhibit of exceptional interest to pastoralists and graziers every year is the comprehensive collection of native grasses staged by the Department. Artistically designed posters called attention to the annual value of wool, beef, and dairy products produced in the State, and, as the aggregate value of these make the grand total of nearly £57,000,000, the great importance to Queensland of good pastures is at once apparent.

Queensland natural pastures are unrivalled, as the collection of grasses staged bore testimony.

There is no doubt that, with the extension of the grazing, the better grasses in some of the more closely settled areas have been eaten out, allowing coarser, less palatable species to take their place; the problem of pasture improvement is therefore worthy of keen research. Much can be done by judicious stocking and conserving and propagating the better species, such as the Mitchell grasses, Flinders grass, native *Panicums*, and other nutritious grasses.

In this year's exhibit, among the *Andropogons* were the far-famed Blue grass and the Satin Top, the former being one of the very best for fattening and grazing purposes. The genus *Astrelba* comprises the highly esteemed Mitchell grasses, of which four very distinct kinds are found in Queensland. Their chief characteristics are not only their drought-resisting properties, but also the rapid way in which they respond to falls of rain after long periods of dry weather, their value in this respect being nothing short of marvellous. Among the Star grasses, to the same genus of which belongs the imported Rhodes grass, are several sorts esteemed for their fodder value. The genus *Anthriscaria* contains the well-known Kangaroo grass, and a near ally of this is the Flinders grass, which, in a green and dry state, is so much relished by stock. Quite an array of native *Panicums* were on view, most of these grasses possessing high feeding values. Beautiful grasses and at the same time useful in the native mixed pasture are various species of *Eragrostis* or Love grasses. The Button grass and the Crowsfoot are cosmopolitan species; the first mentioned is a most valuable sheep grass. Brown Top bears a good reputation among stock-owners. Several species of native *Paspalums* were shown, some being of high food value, particularly for tropical parts. The native sorghums are coarse grasses, but when cut both horses and cattle relish them.

Visitors to the Court were informed by poster that the Department is always willing to identify and report on any specimens of grasses and other plants. Specimens may be sent to the Department of Agriculture and Stock or direct to the Government Botanist.

### QUEENSLAND'S WEALTH IN WOOL.

The Departmental wool exhibit was made up of fleeces selected from different localities in Queensland. They were not the best that could be produced, but were typical of the wool grown in the respective districts.

Many of the fleeces were labelled to indicate either yield, spinning quality, or counts, in order that they might educate in these matters those interested. Numerous cards on the different exhibits illustrated the terms commonly used in the trade.

#### The Departmental Wool Scheme.

Samples of the different named classes, illustrating the classification of farmers' wools under the Departmental wool scheme, were shown. Those shown indicated the standards aimed at and which are maintained during the process of classing. Three hundred and seventy bales last season represented sixty distinct classes, in which the prices ranged from 7d. to 25½d. per lb.

When the wool is first received it is weighed and valued. Sixty per cent. of the value is advanced to the grower free of interest. This advance has been designed to assist the farmer financially until his wool is sold. The amount of wool to be sold at each sale, which is held in Australia, is decided by the National Council of Wool Selling Brokers, who drew up rules whereby brokers undertake to offer wool in the strictest rotation of its arrival at the stores. The amount to be offered for sale in any particular centre also is decided. Each broker sends particulars to the central collecting house of the wools received by him on the previous day. When the allotted number of bales is reached, that day automatically becomes the closing date for the catalogue, and a new list is opened for the next sale. Thus the closing date may be several months ahead of the sale. Owing to the small quantities of wool being received by the Department, and the number of classes these small quantities have to be sorted into, it may take a long time to get a sufficient accumulation to form a bulk line. Therefore, if the farmer has an advance of 60 per cent., he can better afford to allow the Department sufficient time to form bulk lines, thereby avoiding sales under star lot conditions, which are not in the best interests of the grower. It is this

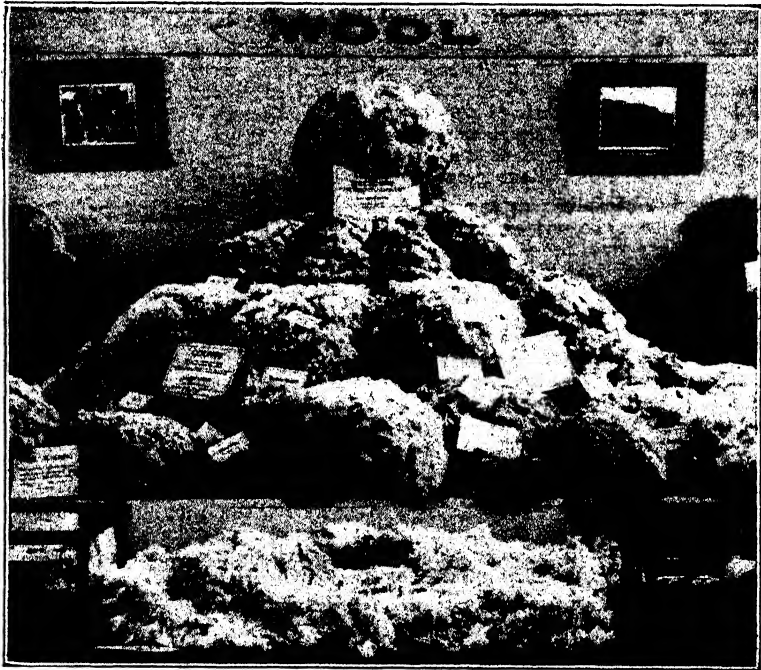


PLATE 62.—FLEECES FROM QUEENSLAND FLOCKS.

A Study of "Counts" and Classes in the Departmental Court.

unavoidable delay that causes dissatisfaction amongst some clients who do not understand the difficulties under which the Department works. The proper classification of wools in Australia is what has given confidence to buyers, and should baling the wool regardless of quality, yield, and colour be allowed, Australia's good reputation as a woolgrower, and consequently satisfactory prices, would suffer. In order to support those growers who can produce bulk lines of even quality, the Department is prepared to send an officer to any holding and instruct the grower how to class his own wool, also his sheep. Advice through correspondence and practical instruction on the holding is always available to those interested in sheep anywhere in the State.

That Queensland wool can be manufactured successfully in Queensland was illustrated by the exhibit of manufactured articles supplied by the Queensland Woollen Manufacturing Company, Ipswich, which showed each process from the raw to the complete.

## QUEENSLAND'S GREAT SUGAR INDUSTRY.

The varieties of sugar-cane exhibited by the Bureau of Sugar Experiment Stations included a number of varieties from Hawaii, West Indies, Java, India, Mauritius, Fiji, and Queensland. The Queensland canes included a number of new varieties raised from seed at the Sugar Experiment Station at South Johnstone. Up to the present about 22,000 of these seedlings have been propagated, but many of them, of course, are weeded out in the process of selection. Commercial trials of the best of them are now being undertaken, also experiments as to their disease-resisting qualities.

### Sugar-Cane Propagation.

The Sugar Experiment Station at South Johnstone, near Innisfail, has, during the past six years, been engaged in the direction of raising cane from the seed found in the arrows. This requires the utmost care, as the seed is very minute and has to be most carefully handled. Specially prepared boxes of soil are used, which have previously been sterilised. The cane arrows, when mature, are gently broken off, spread over the soil, watered, and then covered with glass plates. When germination takes place, a large number of minute shoots like grass appear. When these have made further growth they are carefully pricked out into pots or boxes and are ultimately removed to the field. Several of them which were taken from Badila cane have corresponding characteristics, and it is trusted that a cane equal to the Badila will be discovered.

### Testing of Cane Varieties.

Before any cane varieties are allowed to leave the experiment stations they have to pass chemical and commercial trials through plant, first ratoon, and second ratoon crops. Each variety is tested not less than four times in the course of the sugar season, so that records are obtained giving farmers and millowners information as to whether canes are early or late, and whether or not their sugar contents are sufficiently high to warrant their adoption. This is combined with agricultural trials in the field, so that it may be determined whether such varieties are good croppers. They are further keenly watched for evidence of disease, and no affected canes are allowed to go into distribution. When varieties have passed these trials they are carefully examined and packed before being sent to growers living at a distance from the stations, and all canes are distributed free to canegrowers. The worthless varieties are discarded. Information of this kind could only otherwise be secured by growers and millers at the cost of much time and money and the rejection of many useless canes by the mills, which would be accompanied by severe loss to the growers.

Full descriptions of the varieties exhibited appeared on the cards attached to the canes, which also gave the commercial cane sugar content. Many of these canes at present are undergoing chemical and field tests, while others have passed the probationary period and are being distributed to growers. These varieties, however, comprise a very small part of the number of new and tested canes that have been distributed from the Experiment Stations during the past twenty years.

### Soils, Cultivation, and Fertilising.

Work at the Experiment Stations also comprises the study of soils, cultivation, and fertilising. It is sought to introduce improved methods of cultivation, liming, fertilising, rotation of crops, and conservation of moisture. Growers are taught the principles of cultivation methods by visits to the Experiment Stations, also by lectures and addresses delivered in the various sugar districts, and by the issue of bulletins. It may be claimed that this work has been highly successful. The Sugar Experiment Stations analyse soils free for canegrowers, and give advice by personal interviews or by letter on the requirements of the soil in the way of application of lime where necessary, green manuring and fertilising, and the treatment of the land by proper soil handling. Upwards of 1,800 cane soils so far have been analysed. Cane samples also are tested free of charge, so that growers may know the best time at which to cut their cane. Field officers move around amongst the farmers, giving advice on cultural operations.

### Investigation and Research.

Investigation and research work in connection with the most serious pest of the sugar-cane—namely, the grub—is now being carried out by the Bureau of Sugar Experiment Stations in a systematic manner, and numerous bulletins have been

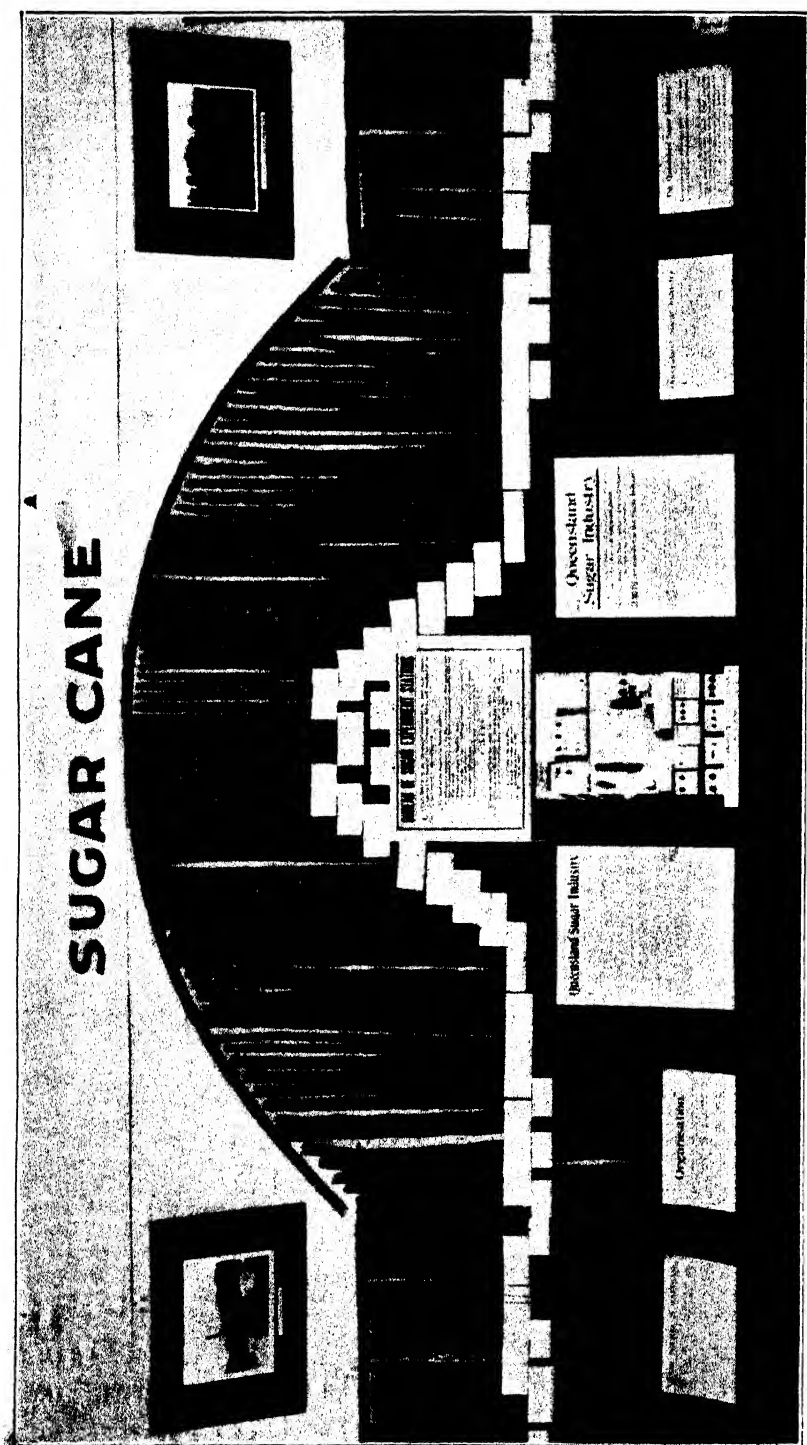


PLATE 63.—A WHITE MAN'S INDUSTRY IN A WHITE MAN'S LAND.

Canegrowing is the most profitable of Queensland's agricultural enterprises. It gives employment to an army of Australian workers, and is the only sugar industry in the world carried on entirely by white labour. In this bay in the Departmental Court the scientific and economic value of the work of the Bureau of Sugar Experiment Stations was strongly represented.

issued upon the subject. The entomological laboratories are situated at Meringa (near Cairns) and at Bundaberg. Chemical fumigants are being successfully used in the destruction of cane grubs. A pathological staff also has been established to deal with diseases in cane, and travelling pathologists are advising cane farmers on disease questions.

### National Significance.

The work of the Sugar Experiment Stations in promoting the agricultural welfare of Queensland in relation to the sugar industry cannot be over-estimated. When it is remembered that this industry is the greatest agricultural one in Queensland, and will produce about 507,000 tons of sugar this year, estimated at a value of about £10,000,000, it can be seen how highly necessary it is that it should be assisted and encouraged in every possible way. Apart from its economic value, however, it has a deep national significance, and has already played a very large part in peopling the North.

### The Sugar Belt.

Appropos of the sugar industry, it is to be noted, on reference to a map of the State, that the land in Queensland used for sugar-growing is included in a long, narrow, coastal belt. Parts of this belt are separated from each other by considerable tracts of non-sugar country. The latter, owing to a deficient rainfall or comparative unsuitability of soil, are not used for cane-growing. This belt is included between latitudes 16 degrees and 28 degrees south, and the bulk of the staple is grown within the tropics.

### Rainfall in Sugar Areas.

The Queensland rainfall, fortunately, is highest during the summer period, at which time the cane plant makes its maximum of growth. The following are average rainfalls in the principal sugar-growing districts:—Cairns, 92.65; Johnstone River, 160.88; Herbert River, 84.91; Mackay, 66.67; Bundaberg, 44.40. Cane grows best when the relative humidity of the atmosphere is high, and this is the case during the wet season in Northern Queensland.

Queensland's sugar production in 1867 was 338 tons, and in 1925 reached 485,000 tons, the record crop to date.

The yield of cane and sugar per acre is improving, due to better methods of cultivation and growth of superior cane. The mills also have largely increased their efficiency, and over £2,000,000 have been spent during the past five years in improving existing mills, while, in addition, the Queensland Government has erected the most up-to-date sugar plant in Australia, in the Tully River district.

## DAIRYING INDUSTRY.

The Dairy Branch again arranged its usual comprehensive and instructive display which occupied three bays at the northern end of the Court of Agriculture. The centre was devoted to dairy products generally, in which butter and cheese predominated.

An interesting portion of the display was that showing the chemical constituents, in their exact proportions, contained in 1 gallon of normal milk. The constituents of 1 lb. of butter and 1 lb. of cheese were also shown.

Cheddar cheeses, both coloured and white, were exhibited in the several sizes made—namely, large export (80 lb.); medium (40 lb.); loaf (10 lb.); and picnic (1 to 5 lb.); Roman, Edam, Luncheon, and Processed.

Varieties of cheese were also exhibited as well as a new rindless Cheddar block cheese. These cheeses were all made in Queensland. The new cheese, however, has not yet been placed on the market.

Samples of both butter and cheese in progressive stages of manufacture were on view.

By-products, such as casein, skim milk powder, lactose, were not overlooked. The multiple uses for casein were also featured. Butter packed in tin containers for the Eastern market lent attractiveness to the exhibit.

Herd testing was given prominence. Full equipment for carrying out this important branch of the work was on view, both as required by the dairyman and the official herd tester. Comparisons were drawn between the profitable and unprofitable cow.

The "Better Bull Scheme," instituted by the Department, whereby dairymen are assisted in securing approved sires for their herds, was a feature in this section.

Balanced rations suitable for milch cows were shown in proper proportions. An outfit necessary for carrying out the Methylene Blue Reduction Test was also shown. This test is invaluable to milk graders at cheese factories for determining the quality of milk, and should attract considerable attention from those interested in milk and cheese production.

One bay was devoted solely to bacteriological specimens as they apply to the many phases of the industry. This section was worthy of close study, as an appreciation of bacterial influences in relation to dairying is of paramount importance in the elimination of secondary grades of produce. The specimens were of absorbing interest to dairy farmers and all others connected with the industry.

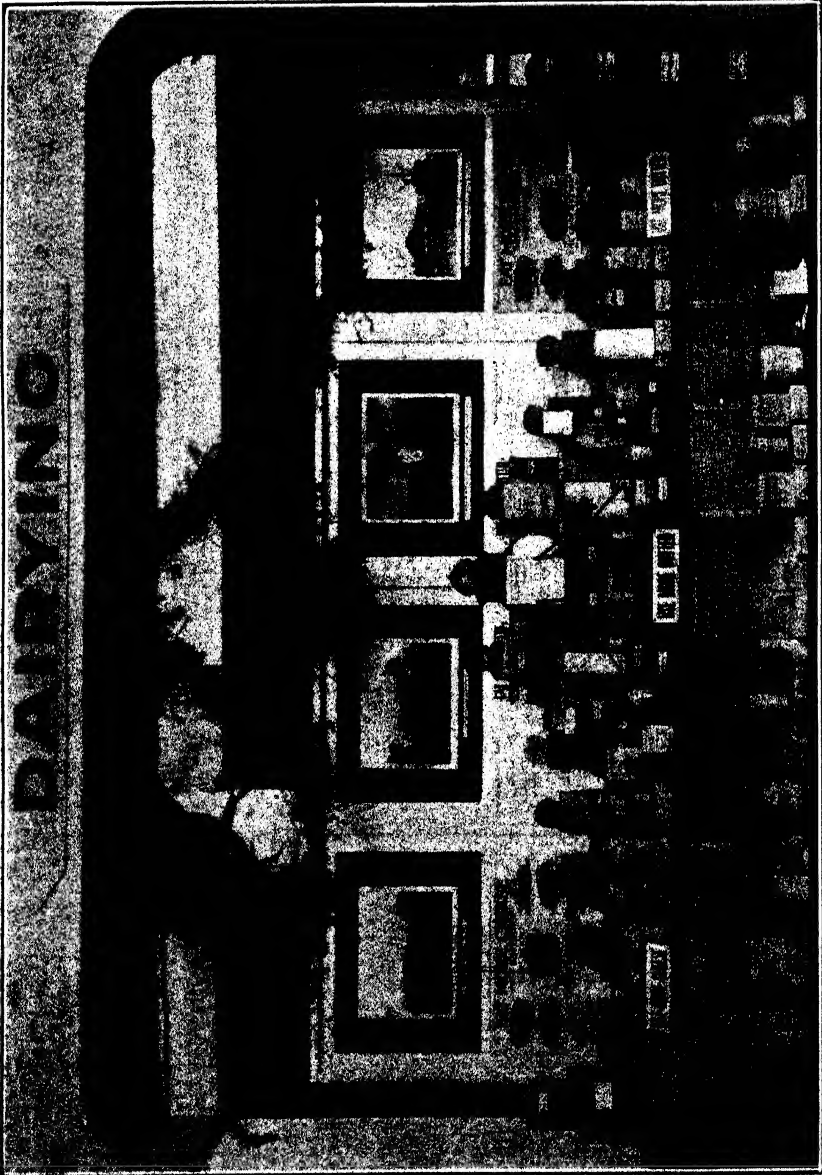


PLATE 64.—A REPRESENTATION OF WHAT THE DAIRY INDUSTRY MEANS TO QUEENSLAND.  
This great enterprise ranks now next to Sugar in aggregate annual value.

**STOCK EXPERIMENT STATION EXHIBIT.**

In the Dairy Branch of the Agricultural Court, one section was largely devoted to illustrating the necessity for absolute cleanliness in all phases of the dairying industry, and sterilisation of those utensils used for holding milk and cream. This section was arranged by the Government Bacteriologist, Mr. C. Pound, and his staff at the Stock Diseases Experiment Station at Yeerongpilly.

The display demonstrated clearly the extent of bacterial growth which results from careless methods of milking, as compared with milk drawn at a dairy where



PLATE 65.—PANEL ILLUSTRATING THE DEPARTMENTAL HERD TESTING SCHEME.

Every farmer who hopes and works for better returns must realise the practical benefit of herd testing in the quest for increased production.

perfect cleanliness is the rule. Specimens of milk drawn direct from the cow under hygienic conditions were shown as remaining for several weeks free from contaminating organisms. Tube cultures of the various germs that are detrimental to the keeping properties of milk, butter, and cheese, also those which impart unpleasant flavours and aromas, were displayed.

#### Contagious Mammitis.

The exhibit would have been incomplete without mention of this disease, which is of special significance to those engaged in dairying. Diagrams of streptococci (the causative agent of this disease) were shown, and full information regarding value of autogenous vaccines in treatment of the disease were fully described.

In connection with the Beef Industry exhibit, a section was arranged solely for the purpose of elucidating the intimate relationship of the science of bacteriology to the preservation of various food products, but more particularly with regard to the processes of freezing, chilling, salting, smoking, drying, and canning of meat and meat products.

A section of a highly instructive nature was devoted to the cattle tick pest, illustrating the life-history of the parasite, and standard methods for its complete eradication; also the latest maps, charts, and other valuable information, illustrating the practical applications and marvellous progress of the work in the United States of America and other countries faced with similar problems.

#### PIG RAISING.

As a result of the progressive instructional campaign of the Instructors in Pig Raising attached to the Queensland Department of Agriculture and Stock, considerable attention has been focussed upon the business of pig farming, both as an adjunct to dairying and to other branches of agriculture. Production is increasing, quality is improving, and with brighter seasonal prospects returns to the producer are much more lucrative than in days gone by.

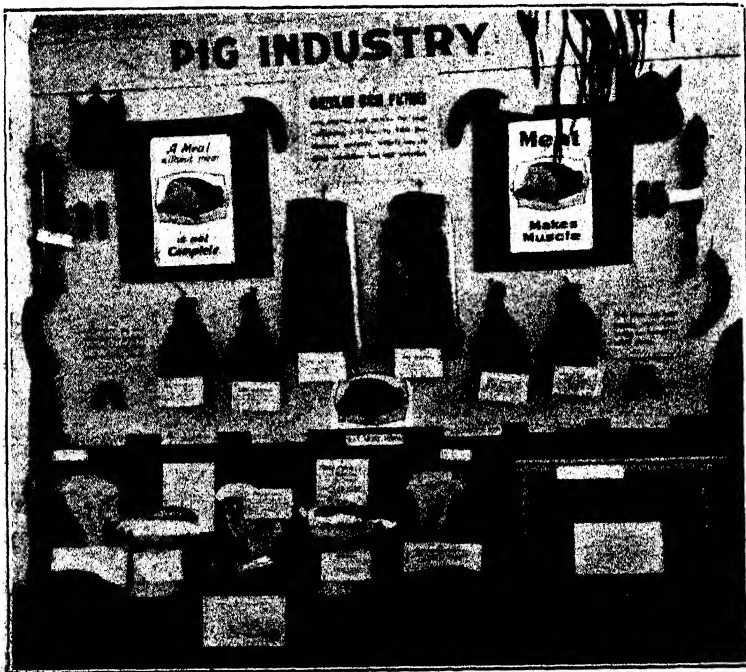


PLATE 66.—THE ECONOMIC VALUE OF PIG RAISING WAS STRONGLY ILLUSTRATED IN THIS AGRICULTURAL COURT PANEL.

The educational value of departmental work is demonstrated in "the goods delivered."

The exhibit of pork products at this year's Exhibition surpassed any previous attempt, and in the Meat Industry Hall and the Court of the Department of Agriculture and Stock were arranged very attractive and educational displays.

A prominent feature of the departmental display was the comparison between various grades of bacon, the objective being to fix the attention of farmers on the urgency of producing nothing but the very best quality article it is possible to market. Our tastes are becoming more refined, the popular heavy-weight fat bacon of years ago has gone for ever. The demand nowadays is for prime quality meaty bacon only. Beautifully coloured and attractive posters pictured the class of pig products demanded on modern markets.

### POULTRY RAISING.

In the Departmental Poultry Exhibit a strong point was made of the economic production of eggs. It was pointed out that the three principal essentials for egg production are stock, feeding, and housing. Illustrations of birds of high fecundity were not numerous, but they depicted the breeds most commonly used for egg production in Queensland. Egg-laying competitions, it was indicated, are among the means used by breeders to ascertain the breeding qualities of stock, while at the same time they make known to those desiring stock birds the breeders from whom they can be procured.

The modern methods of incubation were well illustrated by a representation of a hatching plant with a capacity of 18,000 eggs. From plants such as these, farmers who keep poultry as an adjunct to other rural industries may obtain chickens

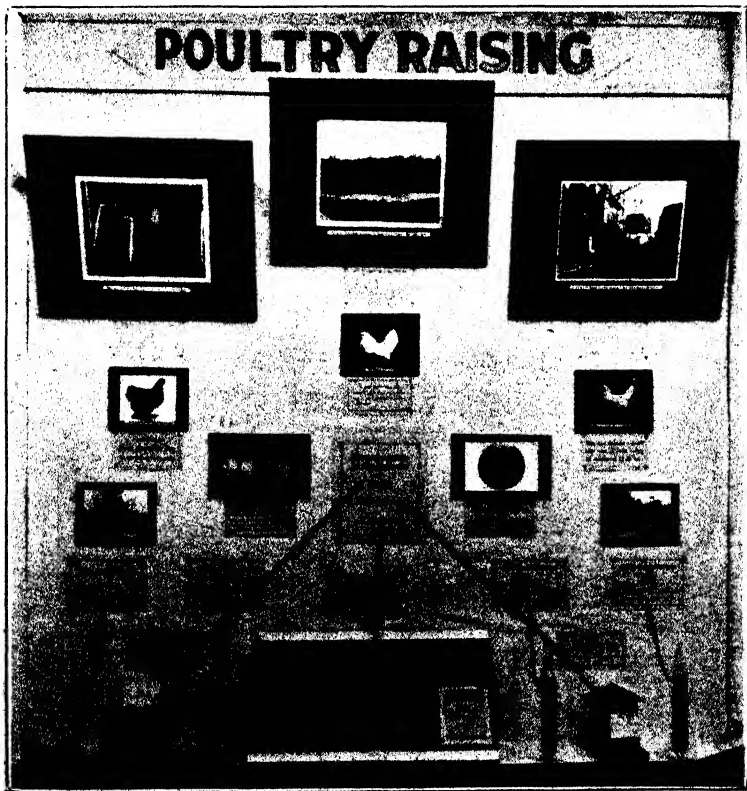


PLATE 67.—THE POULTRY PANEL IN THE COURT OF AGRICULTURE.

The Poultry Industry is developing rapidly in Queensland, and is approaching the status of a staple enterprise. Its annual value is advancing towards £1,000,000.

during the most desirable period of the year, and as these outfits are generally operated by specialists the quality of chickens so purchased is, as a rule, superior to those hatched on a farm where attention to detail is not possible to so great an extent.

A strong feature was also made of the necessity of breeding birds that will produce not only numbers of eggs but eggs of suitable size. The use of a trap nest was suggested for the purposes, and one of simple design was exhibited.

A very neat model of a scratching shed for 200 birds was also exhibited. This model was made by the boys of the Nambour Rural School from plans prepared by the Department of Agriculture. This type of house was suggested as useful to the small poultry farmer or those keeping poultry on a limited area of land. The principal point about these houses is that they are readily cleaned—an essential to the maintenance of health among birds kept on a limited area.

The development of the poultry industry has necessitated overseas export of eggs. The activities of the Queensland Egg Board in this direction were represented. Export has now become the practice of all States producing poultry, and an indication of the development taken place in the industry in Queensland is evident from the following figures, approximately correct:—1925: 2,000 cases; 1926: 6,000 cases; 1927: 8,000 cases. For this season it is anticipated that export will reach as high as 16,000 cases.

Feeding was another strong educational feature, and rations were suggested which included foods that can be grown on a farm and fed in conjunction with skim milk.

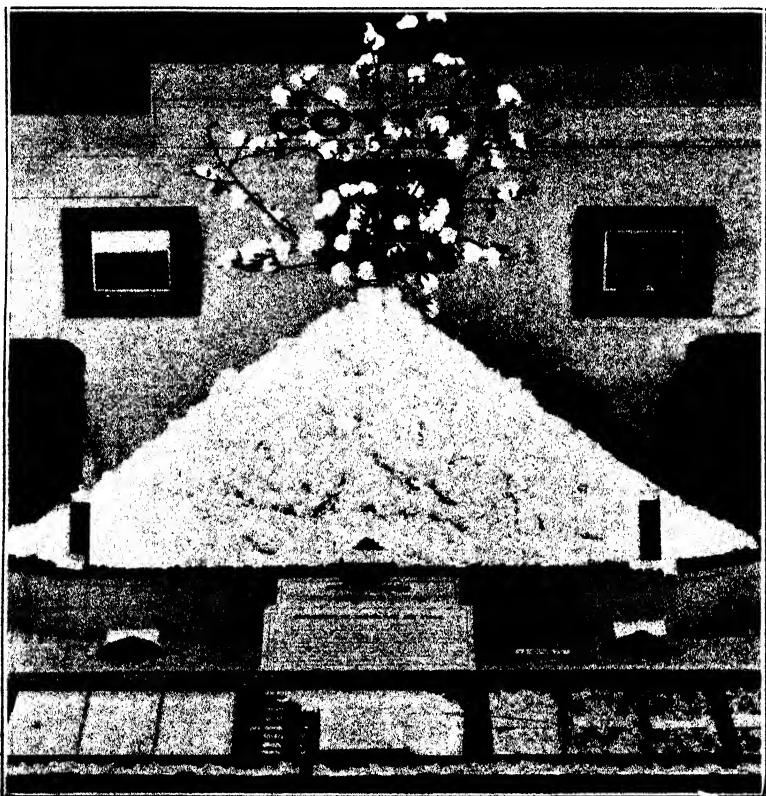


PLATE 68.—THE "WHITE HOPE" OF CENTRAL QUEENSLAND.

The Cotton Industry in this State is becoming firmly established, and this beautiful Trophy illustrated the wide scope there is for its development; also the excellent quality of the Queensland product.

### COTTON.

The exhibit of the Cotton Section was prepared so as to present a comprehensive display of the range of activities in which the Department of Agriculture and Stock is engaging in the endeavour to establish the cotton-growing industry in this State. The different displays were arranged so that one might obtain an idea of the various phases of the operations connected with plant breeding and cultural investigations, and in the grading of the crop at the ginneries.

The visitors to the Court of Agriculture saw illustrations of the various characters of the seed and fibres which the cotton breeder has to study in the evolving of a suitable type of fibre. In addition to these exhibits, a complete set of grades of seed cotton and the corresponding lint grades were presented in conjunction with an illustration of the different staple lengths used in classing Queensland cotton at the ginneries. An instructive display of the cotton-seed by-products was also included.

### WEEDS AND POISONOUS PLANTS.

A representative collection of weeds was a very interesting feature of the Departmental Court. Many of these weeds have been introduced with seeds of economic plants from abroad, and so demonstrate the necessity for the Pure Seeds Act now in force in the State and through which the farmer is well protected. Some have been introduced with straw packing; others, such as Khaki weed, with imported fodders; others, such as the Wild Heliotrope and the Billy Goat weed and Lantana, were imported as garden plants; and others again, such as the Box Thorn and Prickly-pear, for hedge-making. Some, such as the Galvanised Burr, are native plants, which, being left untouched by stock and seeding freely, have taken possession of some Western pastures and stock routes to the exclusion of useful grasses and herbage. Among the collection were some of these, such as the Mustard weed and Fish weed, that give a very offensive taint and taste to milk and butter. Some, such as the Thorn Apple or Stramonium and the Stagger weed, are known to be poisonous or harmful to stock. The question of plants poisonous or injurious to stock is one of the most complex that faces the veterinarian and chemist alike, and one that calls for searching scientific investigation in the State. Representative specimens were shown of the White wood, now regarded as the cause of "Walk-about" in horses in North Queensland, the Northern Territory, and the Kimberley district of Western Australia; the Heart-leaf of Desert Poison Bush; Lantana, which causes the disease known as "Pink-nose" in cattle; Caustic Creeper; and the Fuchsia Bush, which contains a prussic-acid-yielding glucoside. Farmers were informed of the willingness of the Department to report free of charge on any specimens of weeds, suspected poisonous plants, and other growths submitted by them.



PLATE 69.—THE KING OF THE RING.

**ENTOMOLOGY AND PATHOLOGY.**

The investigational work carried out by the Entomological Branch of the Division of Entomology and Plant Pathology was well illustrated in an extensive series of exhibition cases dealing with the life histories of the more important Queensland insect pests. Exhibition panels of more than ordinary interest were those illustrating the life histories of the Queensland fruit fly, the banana thrip, the Rutherglen bug, and the Codling moth. Among other pests dealt with were the potato tuber moth, the pumpkin beetle, the bean fly, and the army worm. Exhibition cases of general entomological interest were those dealing with giant insects, stick

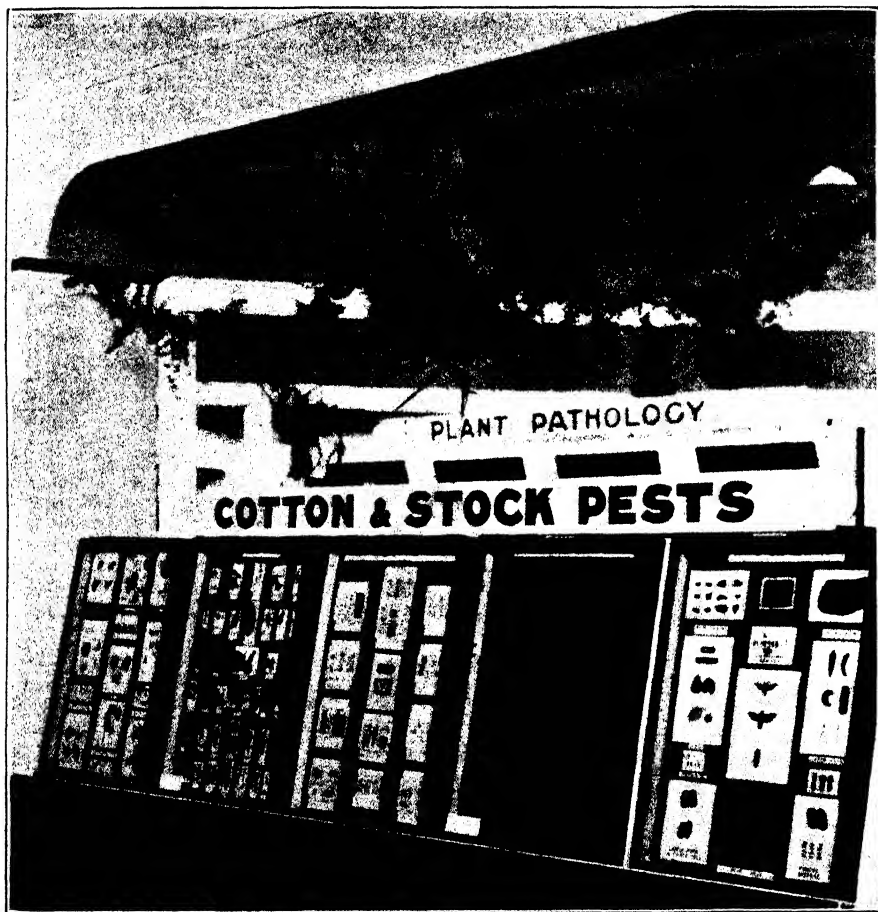


PLATE 70.—THIS PANEL, IN THE DEPARTMENTAL COURT, ILLUSTRATED MOST IMPRESSIVELY THE SERVICE OF THE SCIENTIST TO PRIMARY INDUSTRY.

insects, and insect galls. One very interesting exhibit was a case containing the stomach contents of some of our commoner insectivorous birds.

Each case dealing with an insect pest contained a series of paintings, accompanied by actual specimens of each stage of the insect's life cycle and illustrations of typical injury, were also supplied. Fresh and preserved plant material was also drawn upon to illustrate the nature of injuries inflicted by banana insect pests. Particular attention in this exhibit was paid to the banana weevil borer.

A small panel also showed the ingredients and the method of mixing various poisons used in insect control work.

The Pathological branch of the Division this year was represented by an extensive series of framed photographs and paintings showing the characteristic features of some of the commoner Queensland plant diseases. Another valuable feature of the pathological exhibit consisted of a large series of preserved plant specimens showing typical cases of disease.



PLATE 71.—HOW QUEENSLAND FARMERS ARE SERVED BY SCIENCE.  
A Panel in the Departmental Court.

### FARM BOYS AT THE BRISBANE SHOW. AN EDUCATIONAL HOLIDAY.

Twenty-five boys from farms in different parts of Queensland were the guests of the Royal National Association for Show week. Their visit under the guidance of mentors expert in all the phases of rural industry proved not only a happy holiday for them, but also an eye-opening education. Many had not previously attended a Brisbane Exhibition, so to them it was a wonderful experience. A manager (Mr. T. L. Williams) and a matron (Mrs. Thomas) looked after their welfare at their Showground camp. They were accommodated in a specially-erected building with dormitory, bathroom, reading room, and other necessities for their comfort. The boys were present at the judging of each class accompanied by experts who explained

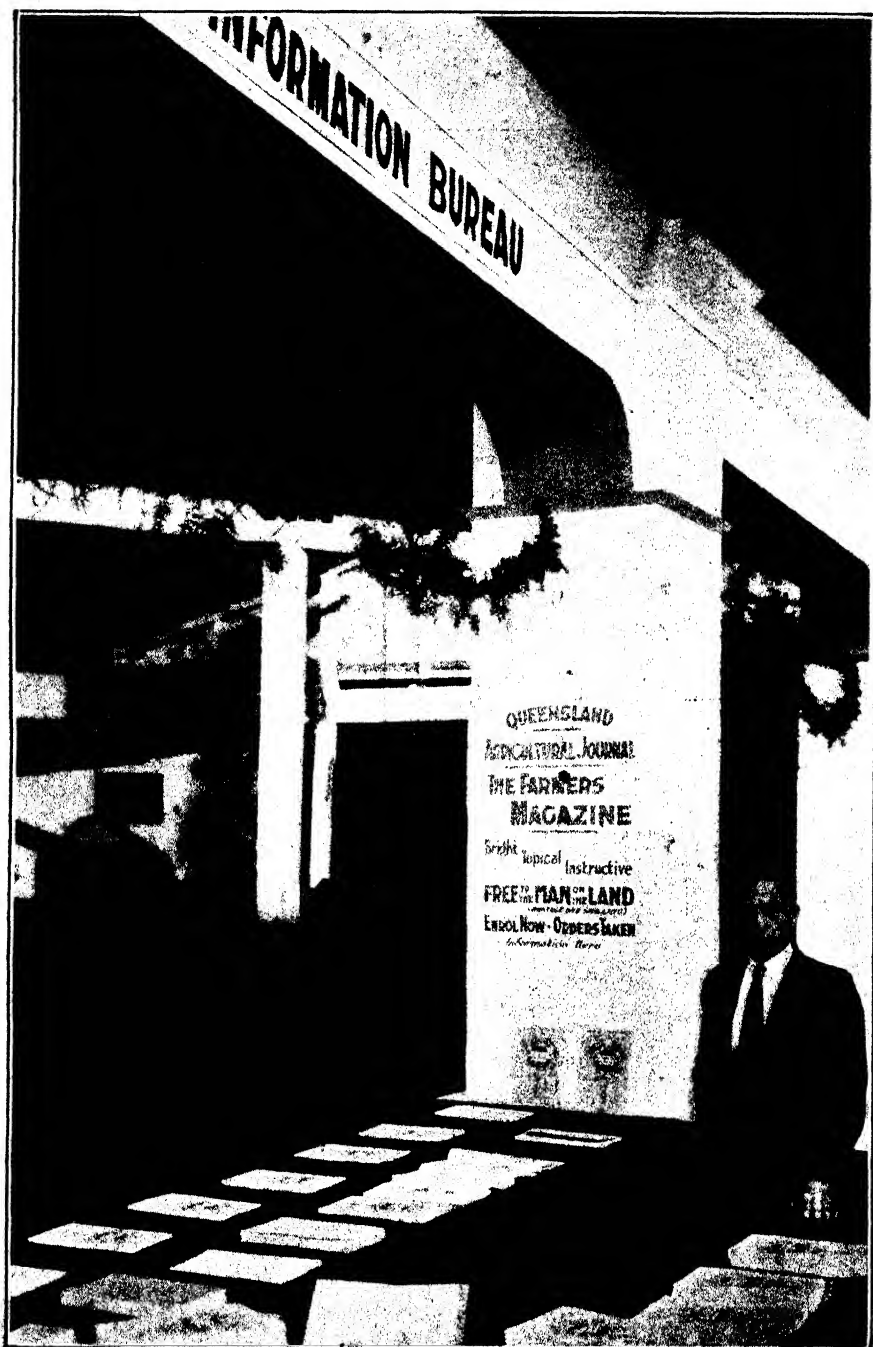


PLATE 72.—THE JOURNAL ALCOVE WAS A CLEARING HOUSE FOR DEPARTMENTAL INFORMATION.

everything to them. Lectures were arranged for each day. His Excellency the Governor, Sir John Goodwin, and the Minister for Agriculture and Stock, Hon. W. Forgan Smith, were among those who visited their camp and delivered inspiring addresses.

All the boys are members of pig, poultry, or calf clubs at their respective schools. The personnel of the party and the schools they represented were:—Maurice O'Donnell (Allora), Thomas Verrall (Aratula), William Evans and George Christison (Boonah), Henry Coupe (Clifton), Aubrey Benson (Cloyne), John Howell (Coaltoun Lakes), Martin Tobin (Dallarnil), John Gray (Enterprise), Walter Neuendorff (Frenchton), Percy Kajewski (Glencoe), Ronald Ritchie and Lionel Grady (Kin Kin), Dudley Beattie (Lagoon Pocket), Fred. Bampton (Mapleton), Arthur Berlin (Marburg), Charles Burgess and Dudley Bellotti (Merlwood), Sam. Franklin (Merrimae), John Titmarsh (Milora), George Nahrung (Miva), Thomas Wilson (Mooloolah), Colin Stenzel (Mount Alford), Ivan Perry (North Arm), and Albert Granz (Norwell).

### **The Governor's Advice.**

His Excellency the Governor lunched one day with the boys and each one was presented to him personally. Addressing them, Sir John Goodwin said:—"I am pleased to have the opportunity of having luncheon with the boys who have come from the country schools, and I am pleased that the National Association has given you the opportunity of learning something that will be of value. It would be wise not to waste one minute of the time that is before you; but, of course, there must be some pleasure. I am going to attend every day and learn something, so take my advice and go closely into every section, because it is a chance of gaining knowledge that you will not regret. There will be something to learn that will be of value to every boy in the country. I hope you will all go home well pleased with the experience you have had. On what you will learn will depend the future of Queensland, for Queensland is a country of primary production."

## **QUEENSLAND AGRICULTURAL COLLEGE.**

### **WORK OF STUDENT FARMERS.**

The reputation of the Queensland Agricultural High School and College, Gatton, as an academy of scientific and practical farming, was greatly enhanced by its exhibit at the Exhibition. It was of considerable educational value, with its extensive notes on the exhibits, the display being situated in a roomy marquee near the John Reid Industrial Hall.

The object of the display was to indicate the lines along which most progress can be made in agricultural and pastoral pursuits. With the co-operation of the Produce Merchants' Association, a display of prime, good, and faulty lines coming into the Roma street markets was provided to show where faults lie, why produce does not meet the requirements of the market, and the difference in prices obtained from good and unsatisfactory lines. There is a necessity throughout Queensland for growing best possible varieties in districts, and plant breeders are working with the object of evolving varieties of maize and other crops which will give a greater yield. Two varieties of maize were exhibited to emphasise this. There were also displays of work done by students, who do sufficient leather, tinsmithing, blacksmithing, and carpentering work to make them handy with tools on the farm. Methods of lubricating farm machinery were indicated, and attention was drawn to the fact that heavy depreciation occurs through lack of lubricants and the use of the wrong kind. The service of science to agriculture was pointed out, and, in particular, the value of superphosphates to Australia. The possibility of improvements in the butter and cheese industry was illustrated. A collection of fine photographic views of the college and its work also were on view.

Interesting comments by Sir John Russell on college soils and the favourable comparison of Queensland wheat soils with those of Canada and Poland were given. The live stock section of the exhibit was a prominent feature. In it was emphasised the necessity for breeding and feeding. Good and bad types of sheep and pigs were shown as examples, and in the application of this to cows it was observed that the average cow yields three boxes of butter a year, and a good cow nine. Bees and fowls were included.

## THE AWARDS.

### DISTRICT EXHIBITS.

#### "A" GRADE.

**T**HOUGH there were only three districts competing in the "A" Grade of the District Competitions, which comprises products and manufactures, North Coast and Tablelands of New South Wales, Wide Bay and Burnett, and South Coast of Queensland, there was, nevertheless, as much interest manifested as in former years. The possible points allowed over the range of classes and sections was 1,585, out of which the North Coast and Tablelands of New South Wales were awarded 1,269, thus winning first prize and the Chelmsford Shield. Wide Bay was only 37 points behind, which shows how close was the competition. Details:—

	Possible Points.	North Coast and Tablelands of N.S.W.	Wide Bay and Burnett District	South Coast of Queensland.
<b>DAIRY PRODUCE—</b>				
Butter .. .. .	90	84½	83½	84
Milk and by-products .. .. .	40	35	20	25
Cheese .. .. .	60	55	50	57
Eggs .. .. .	20	15	17	10
Totals .. .. .	210	189½	170½	176
<b>FOODS—</b>				
Hams and bacon .. .. .	50	40	43	45
Rolled and smoked beef and mutton .. .. .	20	15	18	20
Smallgoods and sausages .. .. .	10	7	10	8
Fish—Smoked, preserved, or canned .. .. .	10	5	9	6
Canned meats .. .. .	25	23	20	25
Lard, tallow, and animal oils .. .. .	20	15	16	16
All butchers' by-products .. .. .	10	7	8	10
Honey and by-products .. .. .	20	18	19	14
Confectionery .. .. .	10	10	8	6
Bread, biscuits, scones, and cakes .. .. .	10	8	8	9
Totals .. .. .	185	148	159	159
<b>FRUITS, VEGETABLES, AND ROOTS—FRESH AND PRESERVED—</b>				
Fresh fruit .. .. .	60	48	56	54
Preserved fruits, jams, and jellies .. .. .	30	30	26	24
Crystallised and dried fruits .. .. .	20	19	18	..
Preserved and dried vegetables .. .. .	10	9	9	10
Fresh vegetables .. .. .	20	18	15	19
Table pumpkins .. .. .	6	6	4	5
Potatoes, English and sweet .. .. .	40	30	28	35
Roots (including meals) .. .. .	14	10	13	10
Cocoanuts, peanuts, and other nuts .. .. .	10	5	8	3
Totals .. .. .	210	175	177	160

DISTRICT EXHIBITS ("A" GRADE)—*continued.*

	Possible Points.	North Coast and Tablelands of N.S.W.	Wile Bay and Burnett District	South Coast of Queensland.
<b>GRAIN, ETC.—</b>				
Wheat .. .. .	50	45	25	20
Flour, bran, pollard, macaroni, and meals ..	10	5	8	3
Maize .. .. .	50	45	35	30
Maizena, meals, starch, glucose, and corn-flour .. .. .	10	4	7	6
Oats, rye, rice, barley, malt, pearl barley, and their meals .. .. .	30	20	15	10
Totals .. .. .	150	119	90	69
<b>MANUFACTURES AND TRADES—</b>				
All woodwork .. .. .	30	28	29	28
All metal and ironwork .. .. .	30	25	27	28
Leather and all leather work and tanning ..	20	20	15	18
Manufactures—Woolen and cotton fibre ..	30	25	15	20
Sheet metal work .. .. .	10	8	8	9
Artificial manures .. .. .	10	2	7	9
Brooms and brushes .. .. .	10	8	1	6
Manufactures not otherwise enumerated ..	15	12	13	14
Totals .. .. .	155	128	115	132
<b>MINERALS AND BUILDING MATERIALS—</b>				
Gold, silver, copper, and precious stones ..	25	19	22	..
Coal, iron, other minerals, and salt ..	30	20	26	10
Stone, bricks, cement, marble, terra-cotta ..	20	5	15	10
Woods—Dressed, undressed, and polished ..	25	22	22	22
Totals .. .. .	100	66	85	42
<b>TROPICAL PRODUCTS—</b>				
Sugar-cane .. .. .	60	46	44	50
Sugar—Raw and refined .. .. .	20	12	18	8
Rum, other spirits and by-products ..	10	8	9	8
Coffee (raw and manufactured), tea, and spices .. .. .	10	5	10	5
Cotton (raw) and by-products .. .. .	30	18	23	15
Rubber .. .. .	10	..	10	..
Oils (vegetable) .. .. .	10	10	10	..
Totals .. .. .	150	99	124	86
<b>WINES, ETC.—</b>				
Wines .. .. .	15	8	5	3
Aerated and mineral spa water, vinegar, and cordials .. .. .	10	7½	6½	6
Ales and stout .. .. .	10	..	8	..
Totals .. .. .	35	15½	19½	9

DISTRICT EXHIBITS ("A" GRADE)—*continued.*

	Possible points.	North Coast and Tablelands of N.S.W.	Wide Bay and Burnett District	South Coast of Queensland.
<b>TOBACCO—</b>				
Tobacco (cigar and pipe), in leaf .. ..	20	12	15	15
<b>HAY, CHAFF, ETC.—</b>				
HAY—Oaten, wheaten, lucerne, &c. ..	30	28	15	20
Hay in sheaf .. ..	5	4	3	4
Grasses and their seeds .. ..	10	9	7	4
Chaff—Oaten, wheaten, lucerne, &c. ..	50	42	39	33
Ensilage and cattle fodder .. ..	20	10	15	9
Sorghums and millets .. ..	10	9	7	6
Commercial fibres .. ..	15	13	10	13
Pumpkins and green fodder .. ..	12	8	7	10
Broom millet .. ..	10	6	6	9
Farm seeds .. ..	15	7	9	10
Totals .. ..	175	136	118	118
<b>WOOL, ETC.—</b>				
Scoured wool .. ..	40	40	36	35
Greasy wool .. ..	60	60	52	53
Mohair .. ..	10	8	10	8
Totals .. ..	110	108	98	96
<b>ENLARGED PHOTOGRAPHS .. ..</b>				
	5	5	3	2
<b>EFFECTIVE ARRANGEMENT—</b>				
Comprehensiveness of view .. ..	20	16	17	18
Arrangement of sectional stands .. ..	25	19	16	18
Effective ticketing .. ..	10	10	7	8
General finish .. ..	25	23	18	21
Totals .. ..	80	68	58	65
Grand Totals .. ..	1,585	1,269	1,232	1,129

**DISTRICT EXHIBITS—continued.****" B " GRADE.**

Honours for the B Grade district exhibit for primary products were won this year by Brisbane Valley, which scored 1,044½ points out of the possible 1,305. This makes the third year in succession in which that district has headed the list.

The districts represented included the Northern Darling Downs, Oakey, Mount Laram, Kingaroy, Brisbane Valley, and Nanango. The interest in this competition was in no way less than that shown in the A Grade Division. Northern Darling Downs was second with 915, and Kingaroy was third with 874. Details:—

	Possible points.	Northern D.D. District.	Oakey.	Mount Laram.	Kingaroy.	Brisbane Valley.	Nanango.
<b>DAIRY PRODUCE—</b>							
Butter .. .. .	90	83½	84	83	84	82	83
Cheese .. .. .	60	60	55	42	48	48	50
Eggs .. .. .	20	12	10	6	12	16	15
Totals .. .. .	170	155½	149	131	144	146	148
<b>FOODS—</b>							
Hams, bacon, rolled and smoked							
beef and mutton .. ..	50	40	35	38	38	39	33
Fish—Smoked .. .. .	10	6	3	9	4	7	4
Lard, tallow, and animal oils	20	15	10	14	15	20	18
Honey and by-products ..	20	15	11	10	14	18	12
Confectionery (home-made) ..	10	7	7	6	4	10	7
Biscuits, bread, cakes, scones							
(home-made) .. .. .	10	7	9	9	10	9	9
Totals .. .. .	120	90	75	86	85	103	88
<b>FRUITS, VEGETABLES, AND ROOTS</b>							
<b>(Fresh and preserved)—</b>							
Fresh fruits .. .. .	60	46	20	48	44	53	40
Preserved fruits, jams, jellies							
(home-made) .. .. .	30	27	25	25	25	27	23
Crystallised and dried fruits							
(home made or dried) ..	20	17	15	12	13	13	14
Preserved vegetables .. ..	10	9	8	9	6	9	6
Fresh vegetables .. .. .	20	15	16	15	16	17	15
Table pumpkins .. .. .	6	4	3½	4	4	5	5
Potatoes, English and sweet ..	40	10	15	11	12	35	28
Roots and their products, n-							
cluding meals .. .. .	14	10	3	3	6	9	5
Cocoanuts, peanuts, and other							
nuts .. .. .	10	6	5	3	9	8	6
Vegetable seeds .. .. .	10	4	5	5	9	5	9
Totals .. .. .	220	143	115½	135	144	188	151
<b>GRAIN, ETC.—</b>							
Wheat .. .. .	50	40	30	44	10	20	25
Flour, bran, pollard, macaroni,							
and meals .. .. .	10	9	7	3	5	3	8
Maize .. .. .	50	30	30	25	40	44	35
Maizena—meals, starch, glu-							
cose, and cornflour .. ..	10	9	2	2	4	6	6
Oats, rye, rice, barley, malt,							
pearl barley, and meals ..	30	18	14	25	18	20	15
Totals .. .. .	150	106	83	99	77	93	87

DISTRICT EXHIBITS ("B" GRADE)—*continued.*

	Possible Points.	Northern D.D. District.	Oakey.	Mount Larcom.	Kingaroy	Brisbane Valley.	Nanango.
<b>WOODS—</b>							
Woods, dressed, undressed, and polished .. .. .	22	15	5	20	20	22	22
Wattle bark .. .. .	15	10	5	5	10	12	12
Totals .. .. .	40	32	20	10	30	34	34
<b>HIDES (1) AND HOME-PRESERVED SKINS FOR DOMESTIC USE ..</b>	15	13	15	5	15	13	8
<b>TROPICAL PRODUCTS—</b>							
Sugar-cane .. .. .	60	6	1	12	14	22	8
Coffee, tea, and spices .. .. .	10	5	..	7	7	5	7
Cotton (raw) and by-products .. .. .	30	18	15	20	20	27	17
Totals .. .. .	100	29	16	39	41	54	32
<b>MINERALS—</b>							
Gold, silver, copper, and precious stones .. .. .	25	15	..	18	20	20	13
Coal, iron, and other minerals and salt .. .. .	30	15	10	20	22	23	14
Totals .. .. .	55	30	10	38	42	43	27
<b>TOBACCO—</b>							
Tobacco, cigar and pipe, in leaf .. .. .	20	12	5	20	10	12	5
<b>HAY, CHAFF, ETC.—</b>							
Hay—Oaten, wheaten, lucerne, &c. .. .. .	30	20	18	22	18	25	14
Hay in sheaf .. .. .	5	4	4½	4	4	4	3
Grasses and their seeds .. .. .	10	8	6	8	7	9	8
Chaff—Oaten, wheaten, lucerne, &c. .. .. .	50	29	30	30	29	45	32
Ensilage and cattle fodder .. .. .	20	5	5	10	11	12	8
Sorghums and millets in stalk .. .. .	10	7	9	5	7	7	8
Commercial fibres, hemp, and flax .. .. .	15	9	3	8	6	13	4
Pumpkins and green fodder .. .. .	12	9	9	6	8	10	9
Broom millet .. .. .	10	7	7	7	7	8	7
Farm seeds .. .. .	13	8	9	7	8	11	9
Totals .. .. .	175	106	100½	107	105	144	102

DISTRICT EXHIBITS—("B" GRADE)—*continued.*

	Possible points.	Northern D.D. District.	Oakey.	Mount Larcom.	Kingaroy.	Brisbane Valley.	Nanango.
<b>WOOL, ETC.—</b>							
Scoured wool .. ..	40	37	34	35	34	37	35
Greasy wool .. ..	60	60	56	54	52	54	50
Mohair .. ..	10	10	8	..	8	8	7
Totals .. ..	110	107	98	89	94	99	92
<b>ENLARGED PHOTOGRAPHS .. ..</b>							
	5	5	4	4	2	5	2
<b>LADIES' AND SCHOOLS' WORK AND FINE ARTS—</b>							
Needlework and knitting ..	25	12	9	14	8	22	9
School needlework .. ..	5	2½	2½	1	1	4	2
Fine arts .. ..	5	5	5	5	3	5	1
School work—maps, writing, &c., by pupils in the district							
Totals .. ..							
<b>GENERAL POINTS—</b>							
Effective arrangement, comprehensiveness of view ..	80	55	59	69	65	73	55
Grand Totals .. ..	1305	915	774½	854	874	1044½	851

**DISTRICT FRUIT CONTEST.**

The display made by the various fruit-growing centres was one of the main attractions of the Exhibition for those interested in products of the land outside of general agriculture. Palmwoods secured first prize, with 175 points; Redlands, with 158½ points, was second; and Buderim, with 154, third. The North Coast district thus won first and third positions. Gayndah fruit-growers entered the competition for the first time, claiming that their main objective was to make known the quality of the citrus fruits grown in their district. It must be gratifying to them to know that in those fruits the decision of the judges was more in their favour than with the other competitors, for they secured 33½ out of the possible 35 points, defeating Montville by half a point. In general display Gayndah was awarded 19 out of the possible 20 points. Details of the decisions:—

	Possible Points.	Buderim.	Cooran.	Montville.	Palmwoods.	Redlands.	Woombye.	Gayndah.
Bananas .. ..	35	27	33	23	29	20	21	..
Pineapples .. ..	35	25	17	23	32	34	32	..
Citrus .. ..	35	29	22	33	33	28½	28	33½
Custard apples .. ..	10	7	..	7½	8	9	7½	..
Papaws .. ..	10	7	9	7	8	8	8	..
Strawberries .. ..	10	7	7	7½	10	8½	7½	..
Other fruits .. ..	10	7	6	7	8	8	7	..
Grading and packing ..	35	28	24	27½	31	27½	25½	..
General display .. ..	20	17	14	18	16	15	17	19
Totals .. ..	200	154	132	153½	175	158½	153½	62½

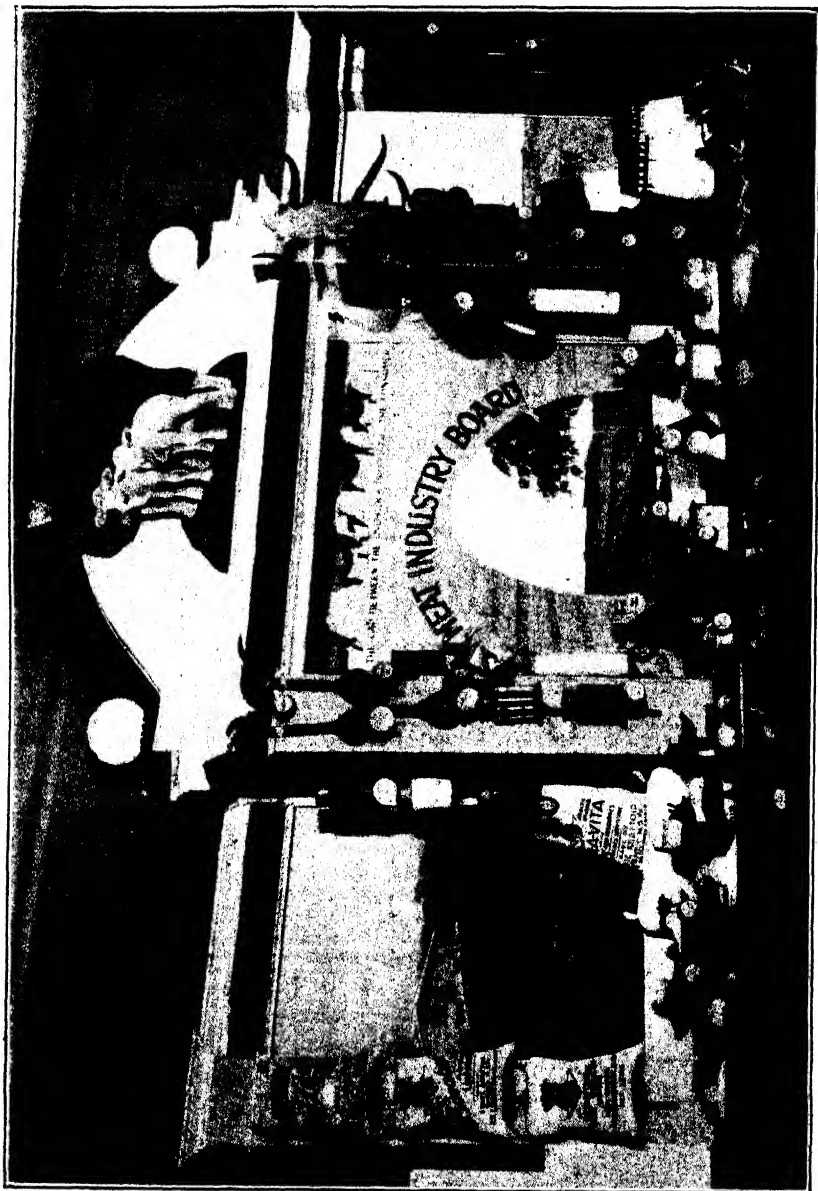


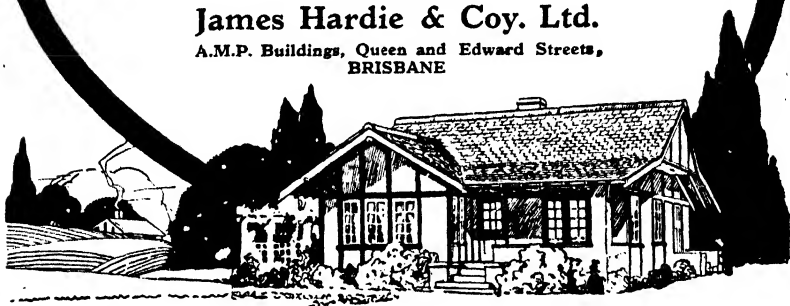
PLATE 73.—WHAT SCIENTIFIC AND INDUSTRIAL RESEARCH MEANS TO THE MEAT INDUSTRY WAS WELL ILLUSTRATED.

# *Build With* **Fibrolite** **ASBESTOS CEMENT SHEETS**

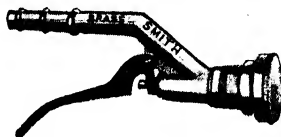
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Proof Building Material for Exterior  
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## **SPRAYERS** *and Equipment*



**FIT THIS AUTOMATIC TO YOUR  
SPRAYER AND STOP SPRAY  
WASTE.**

*In Brass, 8/6 and 11/6 each*

The Sprayer illustrated is the well-known English Mysto No. 1. It is the finest of the knapsack type of Sprayers, being made of durable copper with thoroughly efficient and reliable pump built into the container. Carries comfortably on the back, and is fitted with long brass extension, complete with double nozzle and tap cutoff, giving instant control of spray. Write to-day for prices of all sprayers and spray materials.

**Australian Co-op. Fertilizers Ltd.**  
*Little Roma Street, Brisbane*



## ECONOMY

Many Graziers are recognising that mixing their own Licks is an excellent plan from an economy view point. One bag containing 75 lb. of Vita-Lick concentrated makes 4 cwt. of lick ready for use when mixed with 2 bags (374 lb.) of coarse salt. Vita-Lick keeps your stock healthy.

*Here is an outstanding letter of appreciation supplied by  
Mr. A. M. Holland, of Rampsbeck, Armidale.*

"Some 12 months since I was asked by you for my opinion of Vita-Lick, but refrained from giving an opinion as I had only tried it in a very dry time and then found it very beneficial. Now giving Vita-Lick a thorough trial, in both good and bad seasons, I have no hesitation in recommending it to sheep owners, as I consider that this lick does all you claim it to do. I found sheep supplied with Vita-Lick were not affected with Fly trouble, although sheep in an adjoining paddock, not supplied with Vita-Lick, were struck by flies. Repeat orders are the best recommendation. I have now ordered a further supply through your local agent."

Use "D" formula for Dry Feed. "G" formula for Green Feed.

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**2 Necessaries to Dairymen - SYKE'S DRENCH SYKE'S ANIMOL**

## ***Farming is a fine occupation, if***

the weather conditions are favourable. Why not be independent of the weather by providing your own water supply and

## **Using Hume Pipes**

Also for culverts, troughs, posts, etc.

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## THE MEAT INDUSTRY.

### AN EXCELLENT EXHIBIT.

AN EDUCATIONAL EYE-OPENER—ECONOMICS OF MEAT PRODUCTION—MARKETING PROBLEMS—QUALITY IN LIVE STOCK—NEED FOR BETTER ORGANISATION—THE POLICY OF THE QUEENSLAND GOVERNMENT.

One of the most impressive object lessons ever given to the public of Queensland of the value of the pastoral industry was presented in the Meat Industry Hall at the Brisbane Show.

At the official opening of the Hall some notable addresses were delivered. The hope was expressed by the Premier, Hon. W. McCormack, that the meat people and representatives of the Government would get together and devise some scheme of organisation that would improve greatly the position of the meat industry. The following abridged report of the proceedings will interest all concerned in Queensland's progress.

THERE was not a phase of the pastoral industry, or of the manufacturing enterprises that depend upon it for raw material, that was not illustrated either in kind, diagram, or other forms of vivid representation within the Meat Industry Hall. The Meat Exhibit was one of the most impressive features of the 1928 Brisbane Show. At a glance one was able to see on a large contour map the distribution of live stock throughout Australia and the scope for the extension of the pastoral industry, particularly in this State. Each section was an exhibition in itself of interest to the housewife, the craftsman, and the general public, just as great as it was to the grazier. A striking object lesson in skill and economy was presented at every turn. For instance, the enormous waste caused by careless branding was brought home to the stockman, as well as the respective values of different grades of beef that illustrated the economic loss that is caused by careless breeding. Bad branding alone costs Queensland £150,000 a year in damaged hides. The lesson of the exhibit was that the present value of the industry in raw and by-products, £9,000,000, might be doubled by the practice of sound economy in every department. Methods must be reviewed, herds must be improved, and the economics of meat production must be studied more closely and applied more earnestly in order to bring the industry to the position of high efficiency that it should, in a country like this, rightly occupy.

The Meat Exhibit proved that this State is capable of producing the very highest quality of beef and mutton, and that by the reasonable co-operation of all concerned the live stock industry may be placed on such a basis that it will become a much greater factor in our development and an asset of enormous and ever-increasing value.

### SPEECH BY THE PREMIER.

The gathering at the official opening ceremony in Show week, which was performed by the Premier of Queensland (Hon. W. McCormack), included many notable people in pastoral and commercial circles.

In the course of his address the Premier expressed the hope that the meat people and representatives of the Government would get together and devise some scheme of organisation that would put the meat industry on a better footing.

Referring to the Victorian embargo on Queensland chilled meat, Mr. McCormack said: "Victoria has put a foolish embargo on our meat; but we need not worry about that. They must have our meat. The people in the cities of the South will not allow any Government to prevent them from getting clean, wholesome food at reasonable prices merely to bolster up some local group of people who are handling stock."

The Premier added that the people who were concerned with the export of chilled meat to the South would show them exactly what Chicago showed the Eastern States of America when a contest occurred there between the chilled beef and the cattle killed locally. There could be only one ending. The State producing the cattle and killing

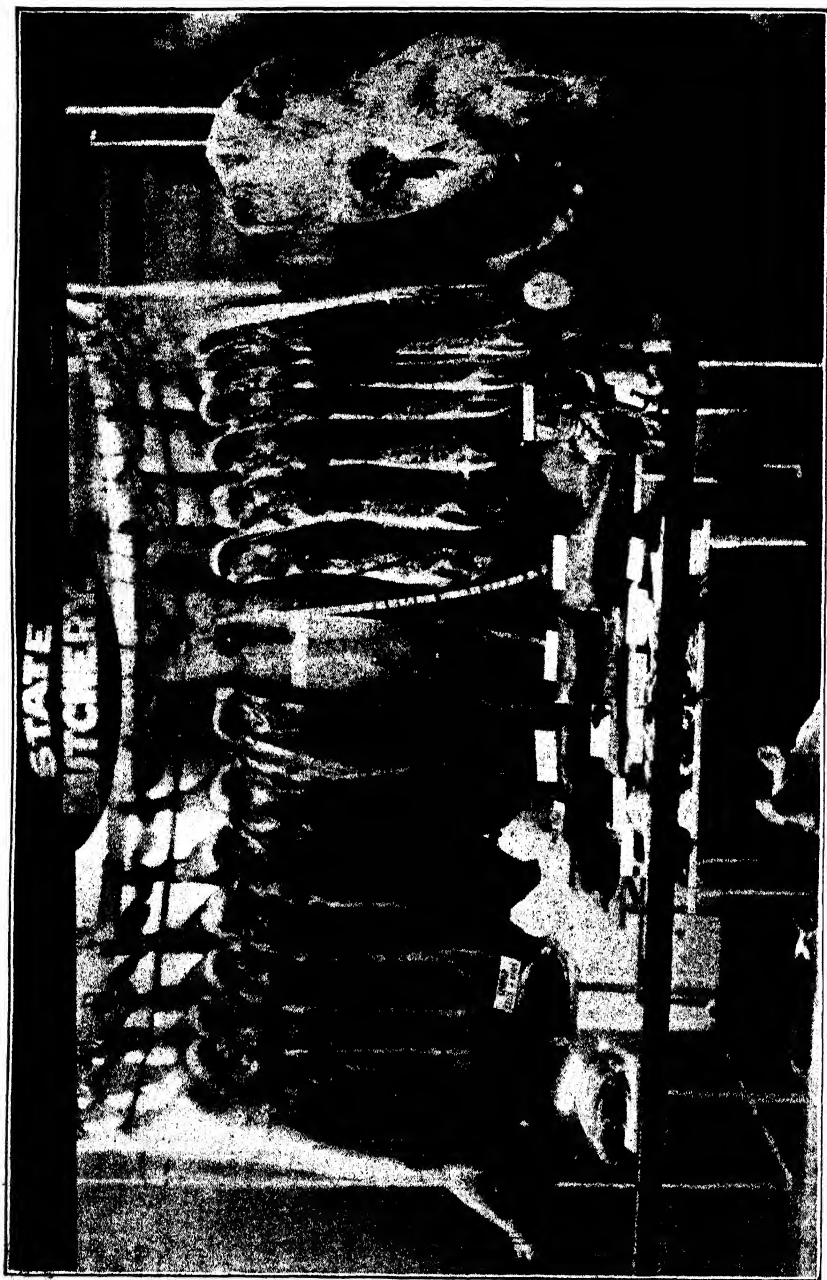


PLATE 74.—FOOD FOR THE MILLION.

A bay in the Meat Hall which was one of the most outstanding features of the Show.

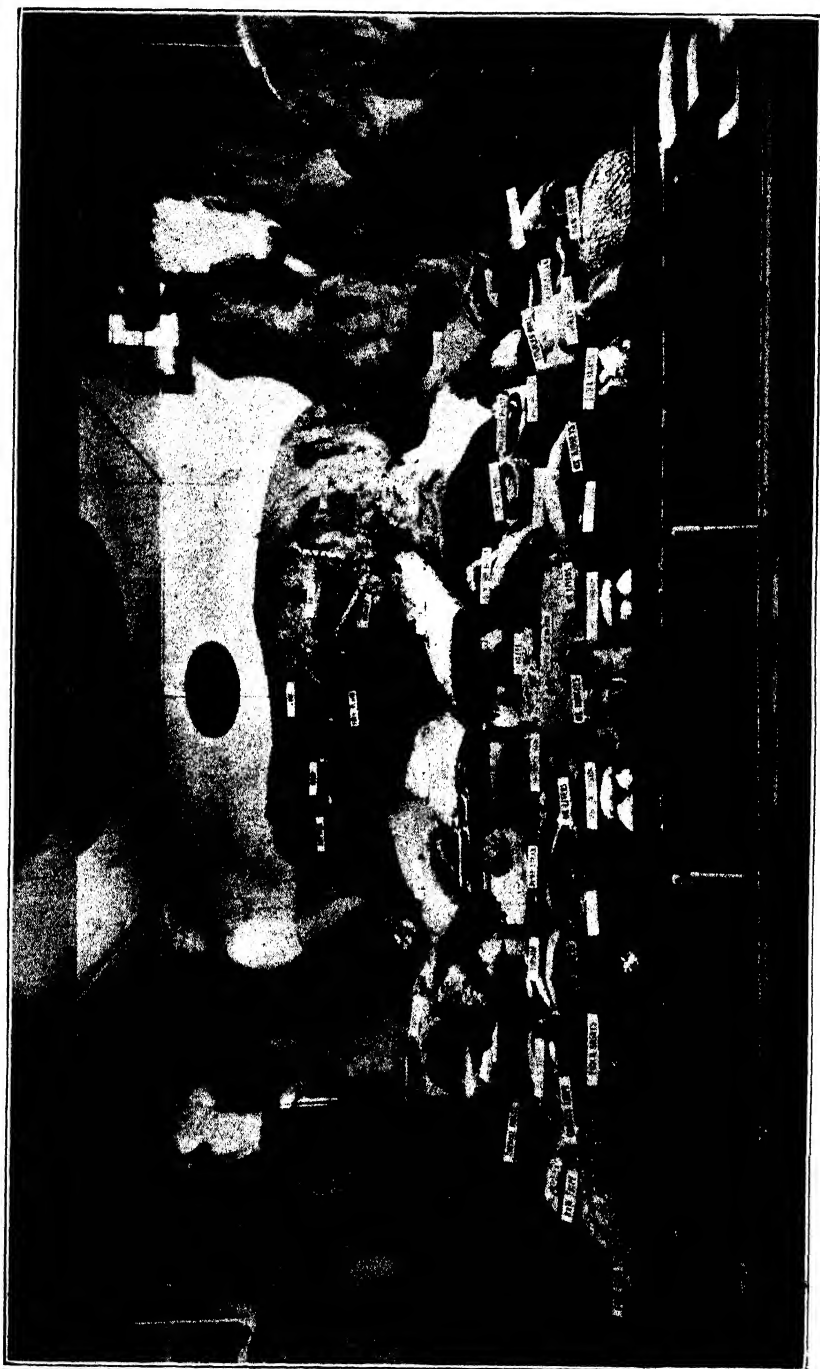


PLATE 75.—“CUTS” AND “JOINTS” OF QUEENSLAND BEEF IN THE MEAT HALL, EXHIBITION.  
This interesting and educative display proved an irresistible attraction to housewives at the Show.

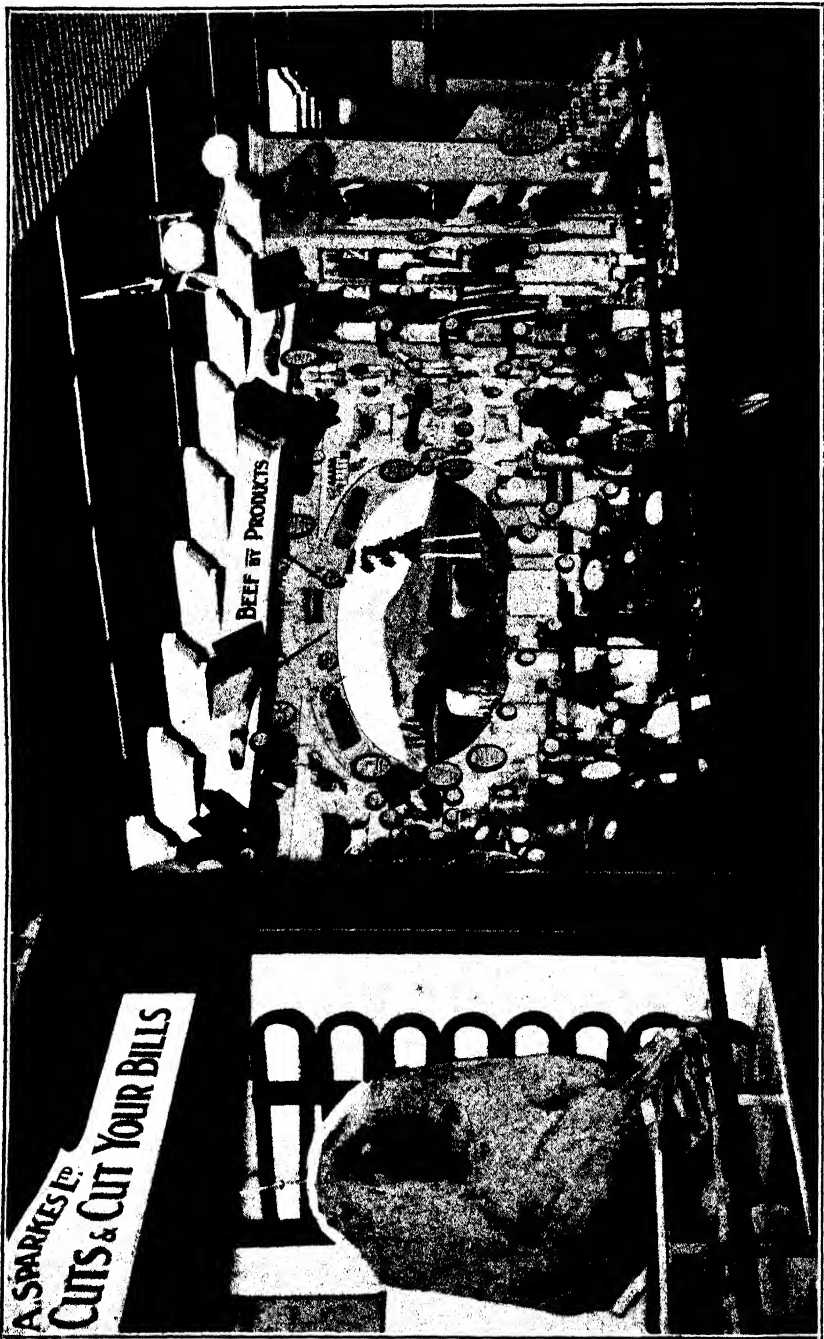


PLATE 76.—THE ECONOMIC IMPORTANCE OF QUEENSLAND'S CATTLE INDUSTRY WAS DEMONSTRATED STRIKINGLY IN THIS BAY IN THE MEAT HALL.

it under proper conditions and transporting it 600 or 1,000 miles need have no fear of its ability to market good meat in the Southern capitals. He hoped the exhibits of by-products would convince everyone that Australians were not getting the best out of the industry. He had visited the meat markets in other parts of the world, especially Smithfield. He was astounded at their methods of handling meat, and was disappointed that Australia was not getting an opportunity of selling in that splendid market. He went through some of the largest meatworks in America—notably Swifts—and he realised, after looking through their by-product department, that Australia had much to learn. That was no doubt one of the reasons why Mr. Sunners had been given an opportunity of seeing the wonderful things that are being done in the United States, so that he could give us the benefit of his skill and knowledge.

### **Improving the Industry.**

"There is a growing tendency, and fortunately so, on the part of many of our people and institutions," continued the Premier, "to raise the general average of the initiative and skill put into our productive and industrial activities. An exhibit of this nature exemplifies this tendency, and is to be highly commended, and I must congratulate those responsible for it. It also serves to indicate that the meat industry is essentially different from most of the businesses with which the public are acquainted. It is the reverse of most manufacturing processes, because, instead of assembling a number of raw materials of known cost into one product, one raw material is separated into many products of undetermined cost." Mr. McCormack said he had been told that the outside value of the by-products, before reaching the subsidiary industries, could possibly amount to £6,000,000, but that, owing to a large percentage of the killing being carried out under circumstances which did not permit of efficiency, the actual value would no doubt be considerably less. It was obvious that the efficiency and development of these subsidiary industries played an important part in determining both the value of live stock to the producers and the cost of meat and other necessities to the consumers, as well as in the economic welfare of the State. Although the producer was far removed from the household distribution of his products, it was nevertheless a subject of great importance to him. In most countries there was a gradual change taking place in the public demand for meat. In Weddell's "Review" on the chilled and frozen meat trade of Great Britain, special emphasis was given to the popular demand for smaller joints, and the objection on the part of the public to those parts of the carcass that required extra trouble in cooking, which was resulting in a wider margin between the value of hindquarter and forequarter cuts of beef. A recent visitor to Queensland, and one who was an authority on marketing, stressed this phase of the meat situation, and stock breeders and distributors would need to take notice of that fact. While there may be always a market of a sort for all classes of

### **Important Changes.**

Within the last decade an entirely new set of economic circumstances had been created, and of the several branches of agricultural and pastoral production the beef cattle industry had been chosen for special investigation, because of its great economic importance, both to the State and the Commonwealth. Associated with the production of beef was the development of a large portion of the State which was essentially cattle country. He was convinced that the profitable utilisation of that land hinged on the successful marketing of the beef it was capable of producing. The Government was asked to solve some of these problems, but it could not perform miracles, nor could it devise an easily applied solution of the difficulties facing the industry.

### **No Short Cut to Prosperity.**

Efficiency in its broadest sense must be applied to every function and every purpose of the business. There was no short cut to prosperity, and the industry was reaping what it had sown. Now was the time to plan for the future. The Government was desirous of helping the industry in every way possible to enable it to overcome the many problems. The Premier traced the history of the meat industry from the beginning of the slump period in 1921 to the appointment of the Beef Commission last year, and he outlined its principal recommendations.

### **Queensland Government Policy.**

It must be realised that the cattle industry of Queensland was of signal importance to the Commonwealth. Several of the other States, such as New South Wales, Victoria, and South Australia, were to-day depending on Queensland very largely for supplies of cattle and beef. It was obvious that the development of the Queensland industry was wrapped up with the development of the chilled beef trade with the

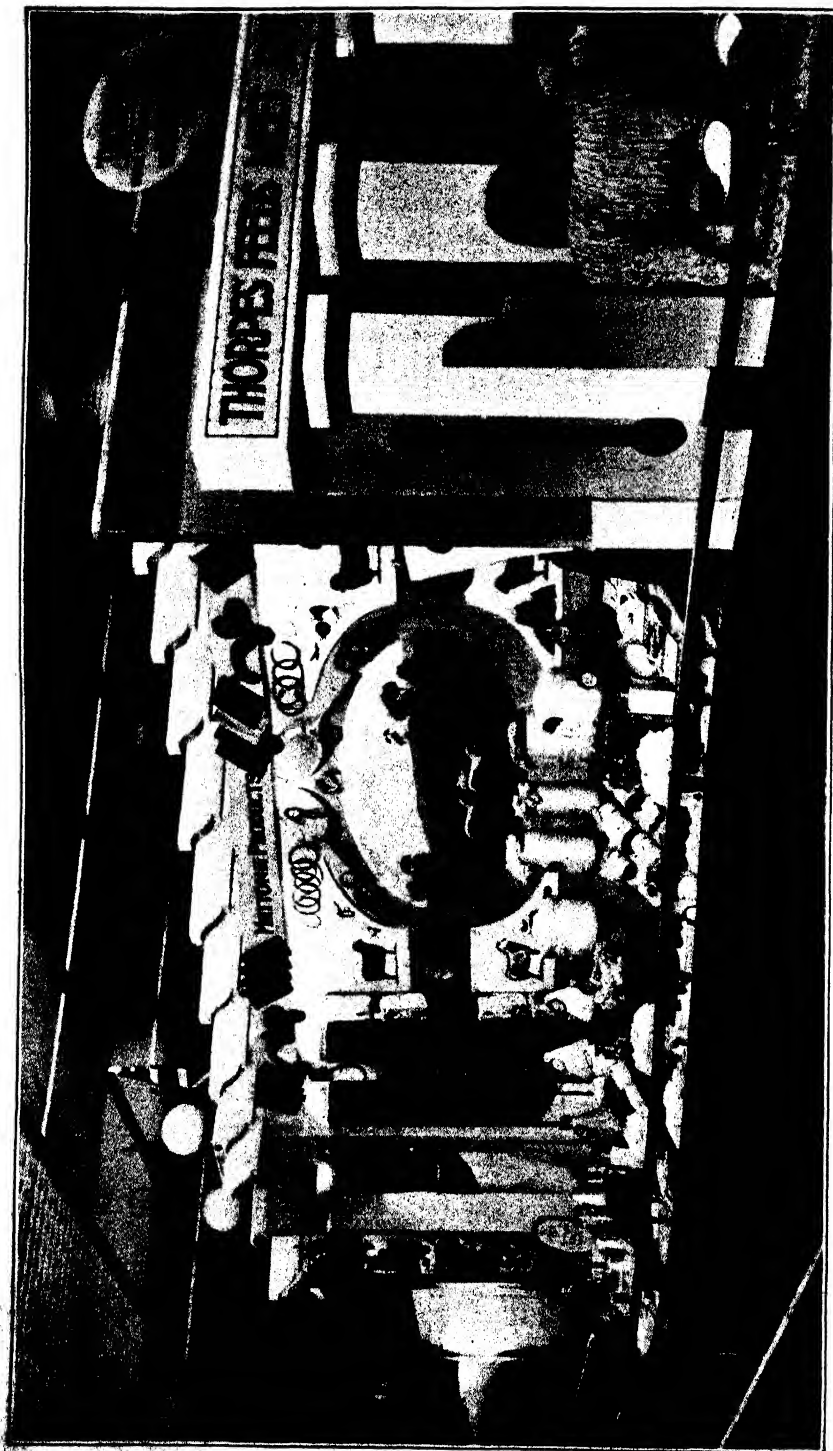


PLATE 77.—A' PANEL IN THE MEAT HALL SHOWING THE PLACE OF SHEEP IN THE ECONOMY OF THE COMMONWEALTH.

Southern States. It was not to be supposed, however, that this was a matter for the Government to develop, but where it could help the industry in working out its problems it was the Government's duty to give that help. Before the industry could place itself on a competitive basis with the southern States and with the other exporting countries of the world, some serious attention must be given to the industrial stage. The Government intended to proceed with such questions as tenure and the eradication of pests, but that was obviously insufficient. While the Government had no intention of establishing any industrial unit as a State enterprise or anything of that nature, some reconstruction of the industrial stage must take place. On that question the Beef Commission has made definite recommendations, taking as a starting point the establishment of a public abattoir for Brisbane, which should be vested in an independent board, upon which the producers and consumers would be represented. At the present time authority was vested in the Brisbane City Council to establish an abattoir for Brisbane, and properly so, if the intention was to handle meat for local consumption only. When the complexities of the industry were realised, and the importance of such an institution fitting in with the needs of the industry, it was doubtful if such an institution could serve its best purpose either under municipal or Government control. The Government, however, was prepared to consider the question of assisting the industry by establishing an institution which would meet the needs of the city area, and at the same time help the cattle industry by centralising killing, provided the principal parties concerned, the cattle producers, desired it, and were prepared to support it. No expression of approval or otherwise had come from those vitally interested, so far.

### Need for Centralisation.

The principle of handling a large volume of business through the one institution, as was done in other countries, was either right or wrong, and the fact that such countries had succeeded on that principle should be sufficient for us to acknowledge that the method of this country, where the volume was split up over innumerable small units, was wrong. Apart from that aspect, there was the further question of the hygienic preparations of the products. If the killing were centralised, there should be no problem in that direction. It would make possible some system of domestic grading of meat, which appeared to be a justifiable recommendation, and one which would not only guarantee the quality of the product to the consumer, but would undoubtedly create the demand for the better article. The problems of the industry were quite apparent, and they must be solved in conjunction with all other features, such as question of tenure, eradication of pests, minimising of live stock losses, and so on.

### Commonwealth Interest.

Dealing with the Commonwealth interest in the matter, Mr. McCormack said it was clear that the development of the surplus-producing areas of Queensland were absolutely essential to Australia as a whole. It was unthinkable that the industry should be allowed to languish. The consumption of meat within the Commonwealth amounted to about 1,000,000,000 lb. a year. There was a wide disparity in prices between those paid in the surplus-producing areas and the prices paid in the Southern capitals, which showed that it was possible for meat prices to climb to a high level in this country, as they had in other countries when consumption had overtaken, or was approximately equal to, production. It was quite safe to say that, in the absence of the surplus production of cattle in Queensland, the price of meat to the consumers of the Commonwealth would substantially increase, and even were it only a matter of  $\frac{1}{4}$ d. per lb., this additional cost to the country would amount to at least £2,000,000 per annum. Seemingly, then, the problem of the industry was that the Governments of the States in which cattle-raising was of primary importance should carry out, from the State point of view, those measures which would ultimately lead to a higher state of efficiency within those States. Having done this, the question led up to a Commonwealth issue. The Government of the State had taken the necessary action to direct the affairs of the industry along these lines, which it believed offered the only common-sense solution. It was to be expected, however, that as the ways and means of improving the status of the industry were afforded to all branches engaged within it, that they themselves would co-operate in seeking its advancement, and a simple practical recommendation had been made whereby the various branches of the industry would organise within themselves to promote its welfare. Again, it was quite apparent that any form of Governmental organisation in an industry with so many parts would not be of any avail; but looking at countries where the live stock and meat industry had tackled its own affairs, the result indicated that when the job was

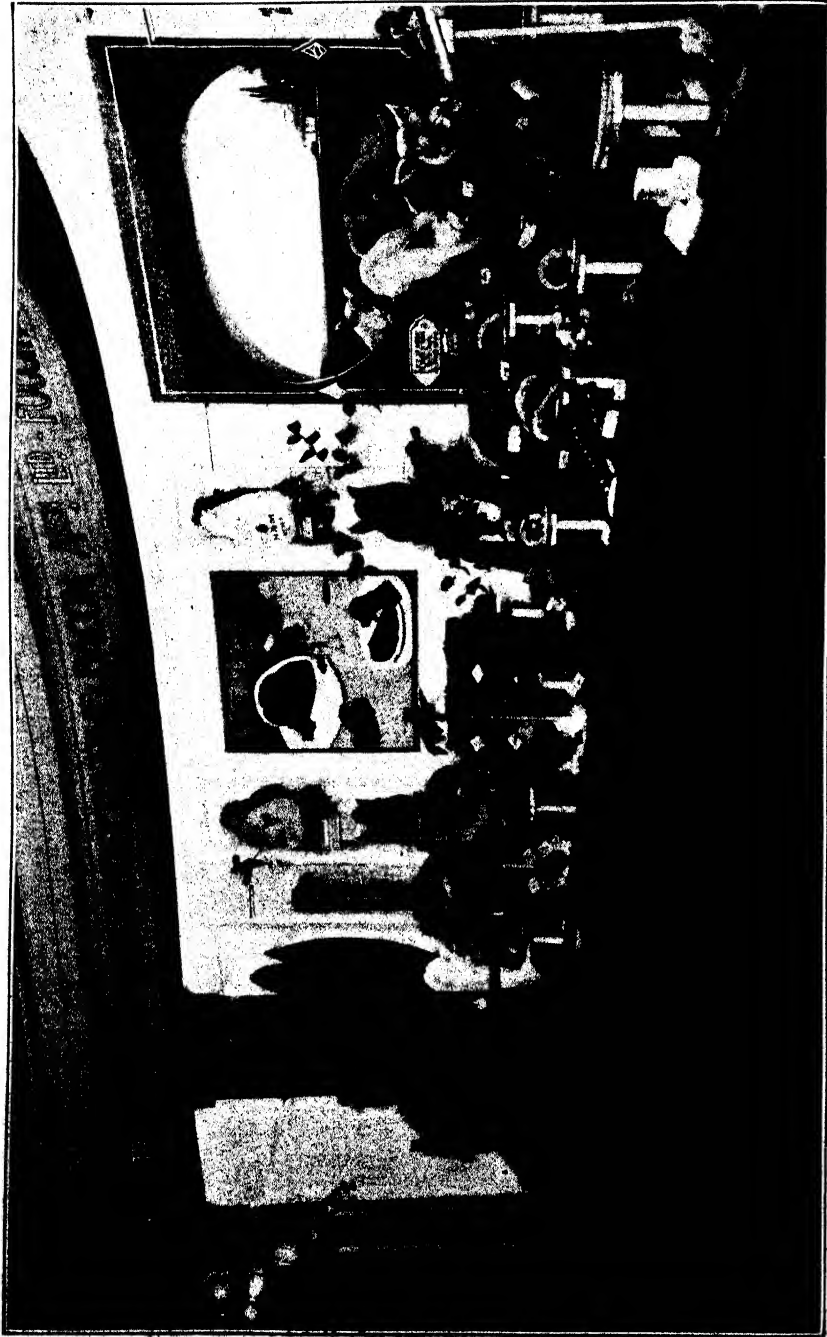


PLATE 78.—AN EXCELLENTLY ARRANGED BAY IN THE MEAT HALL.  
Showing the wide range of Pig Products manufactured in Queensland.

tackled by those engaged in it, with sympathetic Government assistance, progress could be made, and that form of organisation—the voluntary form—was to be highly recommended and supported. If these States producing the surplus cattle followed the recommendation given, the co-operation of the Federal Government could be expected. Queensland, therefore, to fully utilise its cattle country, and to serve its purpose in the Commonwealth, and as the exporting State of Australia, should take the lead along the lines that had been suggested, and if such proposals were given the whole-hearted support of all branches of the industry they could be assured that the Queensland Government would do its part.

### Live Stock Cattle Bred for Quality.

Mr. Ernest Baynes (president of the Royal Agricultural and Industrial Association) said the difference between the modern show and the old-time show was reflected, chiefly, in the great improvement in the live stock exhibits. Live stock was now being bred more for quality. Not only by-products, but by-products from by-products, with the help of science, also were being availed of to the best advantage. Even the tail hair was being put to economic uses. As the by-products, through established grades, were securing better markets, so the main product—meat—also should be graded and identified to create a demand for the better grades. Such a policy would stimulate the breeding of better types of animals, and would give the consumers a higher grade of meat. The exhibits in the Meat Industry Hall presented a very vivid picture of the extent of the live stock industry and its subsidiary industries. He congratulated Mr. E. F. Sunners and Mr. R. Gailey and their staffs on their great achievement. The exhibit was a credit to them, to the exhibitors, and to Queensland.

Mr. John Hiron (acting chairman of the Royal National Association) briefly introduced the Premier, and congratulated everyone who had been responsible for the exhibits. "It is an education," he said, "and reflects great credit on everyone who has taken part in it. It shows how important the meat industry is to Queensland and to Australia."

### Market Decentralization.

Major H. Shenton Cole (representative of the London and North-Eastern Railway) gave an address on "The Distribution of Australian Products in the North of England." He appealed for direct shipments of primary products to Hull, the natural gateway for 12,000,000 people.

Mr. J. P. Bottomley (council steward) hoped the meat men would avail of the Premier's invitation and get together, with a view to improving the industry.

Mr. A. J. B. McMaster (United Graziers' Association), in moving a vote of thanks to the Royal National Association, said the cattlemen had already decided to confer with the object of making suggestions to the Government for the improvement of the industry. He had listened with much interest to Major Cole's address, but he could not understand why the big exporting countries, which had been shipping for centuries, did not go to Hull. Was not London, after all, the best market? After a long period of blackness, the cattlemen were just about to emerge to a brighter future. He felt sure they would receive practical help from the Government. Mr. McCormack had said that if he gave them the land free it would not solve their difficulties. That was quite true. The fact that the Government created an atmosphere of hope was in itself a great help.

Mr. John Hiron moved a vote of thanks to Mr. E. F. Sunners and Mr. R. Gailey, their assistants, and all those who had staged the exhibits and helped to make it a success.

Mr. E. F. Sunners, in response, said the exhibit was an exemplification of co-operative effort. With such a spirit it was simple to make such a successful show.

### A USEFUL AND INTERESTING JOURNAL.

*"A Gordonvale (North Queensland) farmer writes (12/1/28):—"The 'Queensland Agricultural Journal' is not only useful to the farmer, but should be interesting to any lover of Nature, as the articles are very instructive, lucid, and give good material for thought."*

# PHOSPHORUS IN THE LIVE STOCK INDUSTRY.

By

SIR ARNOLD THEILER, K.C.M.G., D.Sc., Dr.Med.Vet., Director of Veterinary Education and Research.

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*This paper was published originally in the "Journal of the Department of Agriculture" of the Union of South Africa (No. 5, Vol. VIII., 1924), and was reprinted in the "Queensland Agricultural Journal" for March, 1925 (Part 3, Vol. XXIII). In response to numerous inquiries, due to the awakened interest in the subject as a result of Sir Arnold Theiler's recent visit to this State, and to meet the wishes of a large number of stockowners in Queensland, another reprint is now presented.—Ed.*

## I. INTRODUCTION.

The article upon "The Cause and Prevention of Lamsiekte," which appeared in the Journal for June, 1920,\* reviewed the recently-discovered significance of phosphorus in the etiology of the disease lamsiekte in cattle. At that time it was already realised that phosphorus-supply also played an important rôle in the *nutrition* of stock over wide areas of the Union, and experiments were therefore instituted to determine the extent to which it entered as an economic factor in beef production. A weighbridge was installed on the farm *Armoedsvlakte* at Vryburg, where the previous lamsiekte research had been carried out, and an extensive series of experiments planned. Some of these have had to be curtailed on account of locust depredations, drought, and the prevailing financial stringency; but others were successfully carried through, with results so striking that broadcasting to every cattle farmer in the Union is now fully justified.

Phosphorus is unquestionably a limiting factor in the growth rate of cattle, and a dominating factor in the maintenance of live-weight under ordinary conditions of veld grazing, so that the nutritional aspects of the investigations now altogether overshadow the original problem of disease. Since the areas over which the nutritional factors apply are far wider than those over which lamsiekte occurs, the annual financial gain to the stock-raising industry in the future can easily be made far to exceed the annual financial losses from lamsiekte in the past. Indeed, by focusing attention upon specific nutritional deficiencies of South African veld, the disease can almost be said to have been "a blessing in disguise."

Increase of milk yield of cows, better calves at birth, more rapid growth of young stock, and superior fattening of adult cattle, all follow simple bone-meal feeding, and agricultural propagandists might well carry the phrase "Bone-Meal for Beef" as slogan cry over all the phosphorus deficient areas of the Union.

The following diagram (Fig. 1) summarises the phosphorus problem as it affects, in varying measure, a very large proportion of the total acreage of South Africa; phosphorus deficiency being a general characteristic of South African soils, although the precise degree of deficiency in different districts remains to be mapped out.

\* The "Journal of the Department of Agriculture," Union of South Africa.

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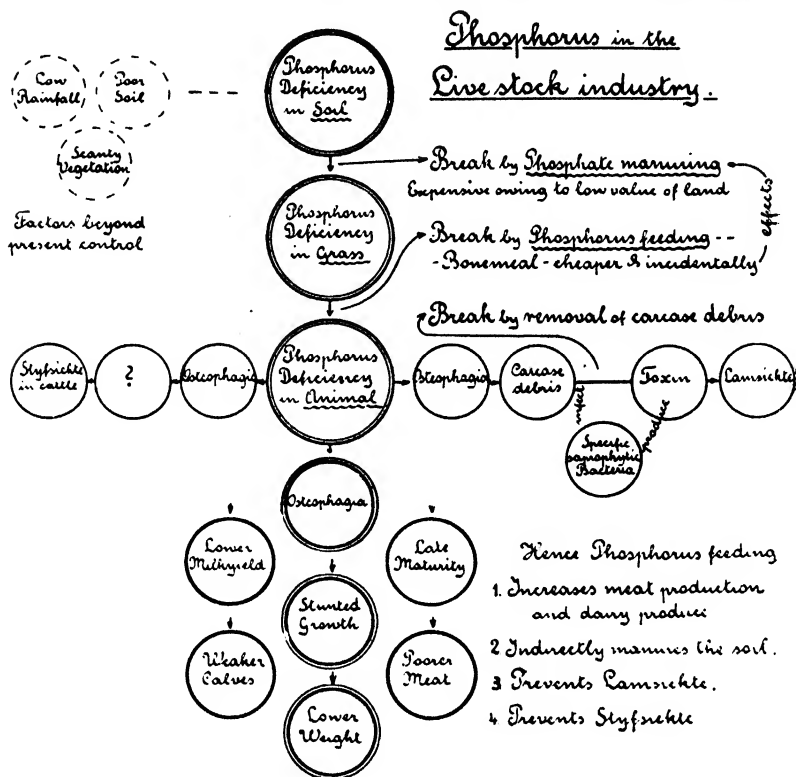
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The various ramifications of this diagram are best considered separately.



## II. LAMSIEKTE.

With regard to the disease lamsiekte little need be said, since the article of June, 1920, dealt with it in considerable detail. It need merely be noted that its position in the diagram explains it as an *indirect* consequence of phosphorus deficiency, the *direct* cause of the disease being a "ptomaine poisoning" brought about by infection of carcass debris with a specific toxigenic saprophyte; an anaerobic bacterium, reminiscent of, but not identical with, *Bacillus botulinus*. If the causal organism is missing, or if there is no protein substrate, from which it can produce its toxin, there can be no lamsiekte, however acute the phosphorus deficiency of the vegetation may be. Hence there are wide areas of the Union over which one or other manifestation of phosphorus deficiency is apparent, but over which lamsiekte never occurs. If, on the other hand, there is no phosphorus deficiency in soil or vegetation, no "piea" (depraved appetite, or more specifically "osteophagia") is manifested by the cattle and they leave decaying carcass debris alone, however much of it may be scattered over the veld. They therefore never ingest the toxin and never contract lamsiekte. Hence there are areas in which both organism and substrate may be present, and yet in which the disease is unknown, simply because the soil is not deficient in phosphorus.

Lamsiekte may therefore be prevented *either* by cleaning the farm of all carcass debris *or* by feeding phosphorus compounds to the cattle. *Both* are recommended; the first on general hygienic grounds, the second for the reason that the cost of feeding bone-mel is *repaid many times over* in the improved condition of the cattle, quite irrespective of the insurance provided against the disease.

As the diagram indicates, the same result can be achieved by phosphatic manuring of the soil, but, as will be shown later, the cost is prohibitive for just those areas over which lamsiekte is most rife.

## III. STYFSIEKTE.\*

Again, with regard to this branch of the diagram (Fig. 1), little need be said at present, beyond stating that the disease styfsiekte is now under special investigation on the farm of Mr. Richards, *Shepstone*, in the Ermelo district; and that it can quite definitely be prevented by feeding *bone-meal* or other material containing sufficient digestible phosphorus.

It may indeed turn out to be an extreme form of phosphorus deficiency, a real "aphosphorosis"; or a mixed deficiency disease in which low lime as well as low phosphorus plays a part; or there may be an hitherto unsuspected link in its etiological chain.

It occurs on some phosphorus deficient soils, but not on others; is prevalent, for instance, on the Ermelo High Veld where lamsiekte is unknown, but absent at Vryburg where lamsiekte is prevalent. There is, therefore, an unknown factor, denoted by an interrogation mark in the diagram; which, however, will not disturb the practical farmer so long as he is satisfied that he can control the disease by *bone-meal* feeding. He can do this, easily and effectively, and in the process enormously improve the condition of his cattle.



Fig. 2.

## IV. PHOSPHORUS DEFICIENCY IN THE ANIMAL.

So much, then, for the side branches of the diagram, ending with disease. The direct chain of events, commencing with poor soil and ending with poor beef, may now be considered. The lower part of Fig. 1 is of more interest to the cattle farmer, and may therefore be dealt with first, leaving consideration of soil and vegetation to the end.

*Osteophagia*.—This is the most obvious outward sign, or clinical symptom, of phosphorus deficiency in *cattle*; and although not infallible, is a very valuable indicator of such deficiency in the majority of veld-bred bovines. Curiously enough it is not shown to the same extent by other animals; is, for instance, only feebly manifested by sheep.

*Osteophagia* is a specific form of "pica" or "depraved appetite," showing itself as a special predilection for bones. In extreme cases "*osteophagia*," may pass over into "*allotriophagia*," in which specific discrimination is lost and the animal will chew any sort of rubbish at all. In its milder forms the abnormal appetite is quite finely adjusted, and only the best sun-bleached bones are eaten. In its more aggravated forms, any putrefying bones may be eaten, and it is not an uncommon sight to see "extreme cravers" crowding round the rotten carcass of a dead animal. The accompanying photograph (Fig. 2) shows "typical *osteophagia*" in the three animals. The attitude of all three is quite characteristic, and with the middle animal

\*Stiff or starch sickness.

the white bone is clearly visible, sticking out of the left side of the mouth. The sound of "bone chewing" is usually easily distinguished, and if presented in the flesh these cattle would make quite a musical trio.

Owing to the nice discrimination displayed in typical osteophagia, it is possible to sort out a herd, for experimental purposes, into "marked cravers," "slight cravers," and "non-cravers." This is simply done by first offering sterilised "rotten bones"—i.e., bones still possessing a distinctly putrid odour. The animals which will chew such bones are entered up as showing "marked osteophagia." The remainder of the batch are then driven over to another corner of the "testing kraal" and allowed access to "sweet bones"—i.e., bones which have been well bleached in the sun, and which no longer possess a putrid odour. Any animals which will chew such bones are entered up as showing "mild osteophagia"; and the remainder, displaying no predilection for bones at all, recorded as showing "no osteophagia."

Fig. 3 illustrates a small scale test, using boxes for the test bones.

Four of the animals are clustering round the boxes. A fifth (extreme right) has taken a bone and is obviously chewing it with relish. The sixth, presenting a "scornful posterior" on the left, is apparently a non-craver. The method of "testing for osteophagia" can of course be varied to suit circumstances and, as succeeding charts will show, has proved of enormous value in investigating phosphorus deficiency in cattle.

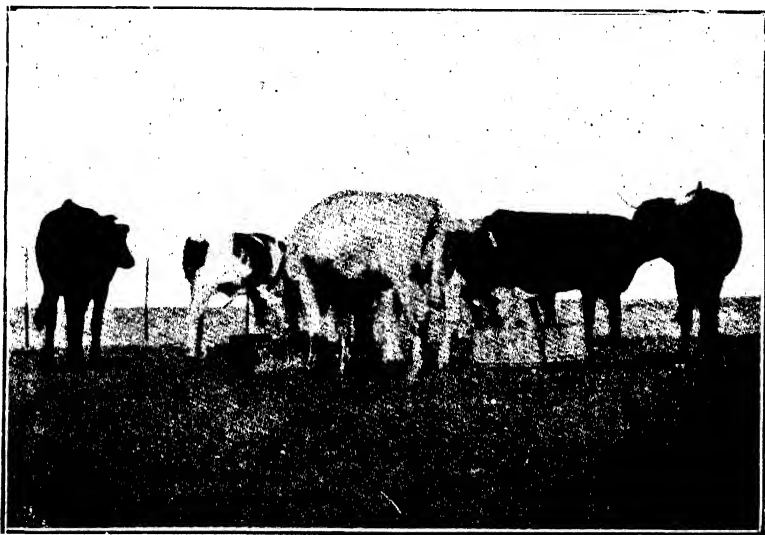


FIG. 3.

*Live-weight, condition, and growth.*—The osteophagia just discussed would represent little more than an interesting curiosity to the farmer but for the fact that it is the precursor of disease and the index of defective nutrition in his cattle. Indeed, the South African farmer has not only known "piea" all his life, but has treated it as normal. In spite of the lamsiekte article of June, 1920, many farmers still disregard its significance, and it is one of the express objectives of this present paper to convince them that osteophagia means not only danger of disease, but consistently poor beef production. The next illustration (Fig. 4) shows two animals of the *same age* (about three years), both restricted to natural veld grazing, but one given an allowance of 3 oz. of bone-meal per day for about 15 months before the photographs were taken; and the other not.

The upper animal is a lean heifer taken in the attitude of osteophagia. It is obviously stunted in growth and poor in condition. The lower animal displays a creditable corpulence, shows no osteophagia, and is well grown for a veld-bred ox. Fifteen months before both were about the same weight, and the *only difference* in feeding was the *bone-meal ration*. This comparison is certainly selected, but as the following charts show, the *average gains* in live-weight from simple bone-meal feeding are quite extraordinary.

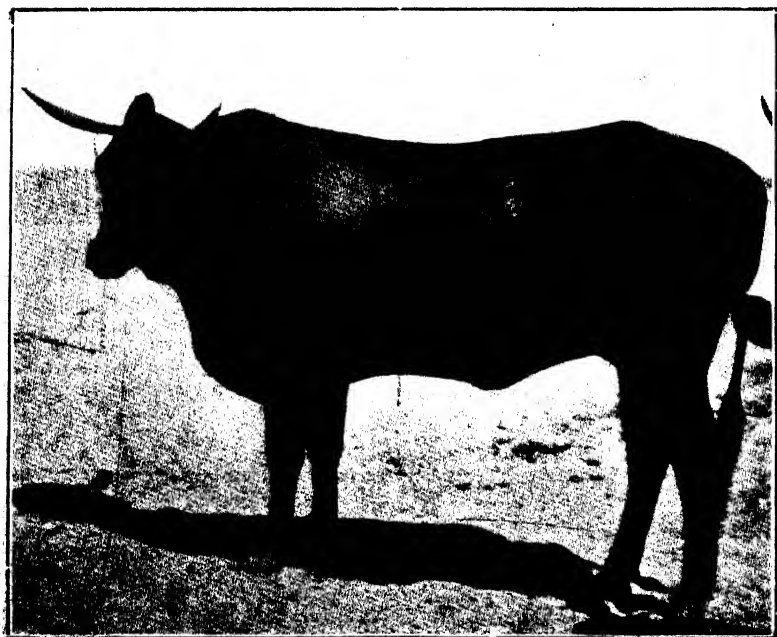
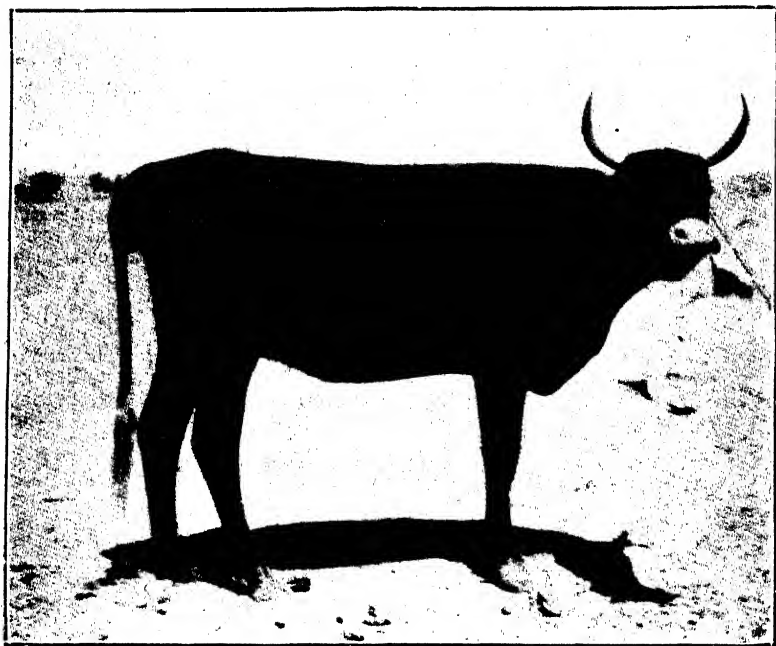


FIG. 4.

*Gains of a Mixed Herd.*—Fig. 5 charts the average weight of two similar batches, fifty in each, of mixed cattle of various ages from about two to seven years, one receiving a bone-meal ration, the other not. Both lots *average* about 700 lb. per head; a figure normal for a miscellaneous lean herd in the Vryburg District at the end of winter. Apart from the bone-meal ration both lots were *confined exclusively to natural veld grazing*, and the large number in each mob completely precludes fortuitous variation. The difference is therefore *solely attributable to the bone-meal*: 3 oz. per head per day, excluding Sundays, although as subsequent experiments have shown, the same results could have been obtained on less.

The experiment was commenced in June, a time at which the Armoedsvlakte veld had reached the dry winter stage. The grass was meagre, and owing to shortage of grazing, both lots diminished in weight until the end of September, although the bone-meal lot *lost less* and were at that time 25 lb. per head heavier. The first green grass of the season then began to appear on the dry veld and both batches commenced to pick up in condition. By May the control lot had fattened up to an average weight of about 800 lb. and the bone-meal lot to approximately 900 lb., the actual superiority averaging 105 lb. per head. This, it must be emphasised, is practically all extra butcher carcass. At the same time the *whole* carcass weight of the superior animals is worth more per lb. owing to its better quality, deposition of fat between the muscular fibres making for more tender saleable meat. Merely from the gross weight point of view, however, the control cattle gained 14 per cent. over a period of eight months, while the bone-meal cattle gained 29 per cent., or more than double.

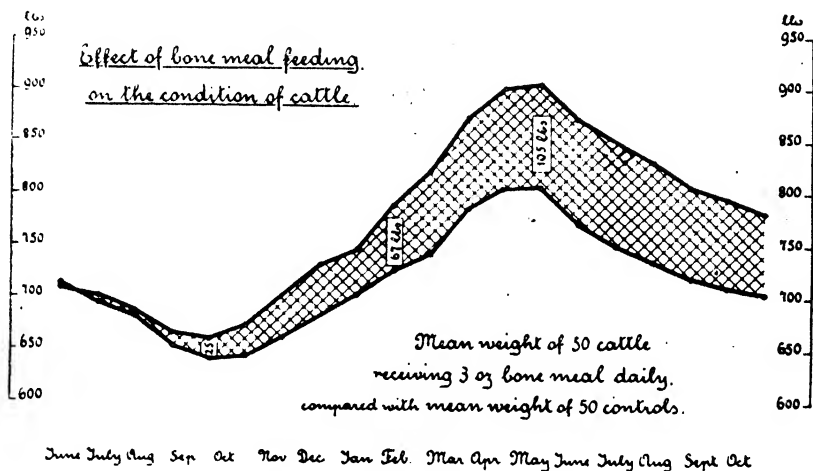


FIG. 5.

Of further general interest in this curve is the *winter fall* in live-weight of animals confined to the poor pasture of a drought season; a common experience in Bechuanaland and all regions of low rainfall. As will be shown later, the feeding value of the grass after the seed has fallen is at best not really high. During the past season the available supply was scanty in proportion to the stock carried by the farm, and the young grass of the ensuing year delayed by drought. Both batches lose in condition, the controls dropping back to their initial average weight of 700 lb. shown at the commencement of the experiment and, therefore, showing practically no commercial profit for the year's grazing. Although the bone-meal lot also lose about 100 lb. per head in weight, through simple semi-starvation on the poor winter pasture, they nevertheless *maintain the advantage* gained during spring and summer, survive the winter 100 lb. heavier than the controls, and are ready to increase that advantage still further the moment the veld improves.

In a good year the winter loss may be avoided, although it is rare to find animals in this region actually gaining appreciably in weight during the months June to September. In all these areas of poor soil and low rainfall, however, where it is exceedingly difficult to grow and store winter feed for stock, a winter loss of anything from 5 to 20 per cent. in live-weight, according to season, has to be faced; and the gains only counted upon during the spring and summer months. This point, so disadvantageous to a beef export trade, will be referred to again in discussing the composition of the vegetation.

*Gains of Young Oxen.*—If bone-meal feeding is commenced earlier in life the difference in live-weight is still more pronounced, since growth as well as fattening is enhanced by removal of the phosphorus "limiting factor." Fig. 6 summarises the results with young oxen, weighing about 650 lb.

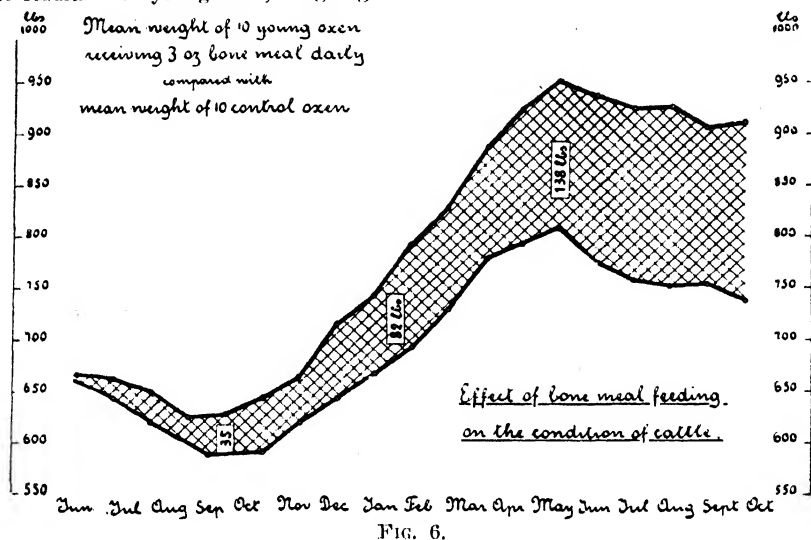


FIG. 6.

As with the previous mixed herd, both batches lose weight from June to September, owing to the poor quality of the winter pasture. The lot receiving bone-meal, however, make better use even of the poor veld, *lose less*, and at the turning point of spring are still 35 lb. heavier per head. Fattening up, and growth, then proceeds upon the new veld vegetation, and by May even the controls have increased to about 800 lb., or by 21 per cent. The bone-meal lot increased to 950 lb., 42 per cent., or *twice as much* as the lot receiving no bone-meal; showing a clear superiority of 138 lb. per head. Calculating upon the initial weight, this represents an extra gain of over 20 per cent. within a year, solely as a result of bone-meal feeding. The real extra profit is still higher, since on a keen competitive market the superior animals find a ready sale, while the controls run the risk of "kaffir meat prices." An auctioneer's valuation showed an extra cash value of £3 per head in favour of the bone-meal lot, as against an actual expenditure of six shillings (55 lb.) for bone-meal. A glance at the next photograph, Fig. 7, showing a selected individual (the youngest) from each lot, will leave no cattle farmer at variance with the auctioneer.



FIG. 7.

A year before, these two animals were approximately the same weight. The difference in butcher quality and in market value is obvious.

Regarding Fig. 6, it may be noted further, that during the latter period May-October the "winter loss," already discussed, is again apparent, but is less pronounced than in the preceding year. The point of interest is that during this winter the bone-meal batch practically retain their gain and so indirectly increase their lead from 138 lb. to 170 lb. per head.

*Specific Influence on Growth.*—When bone-meal feeding is commenced still earlier, and the influence of phosphorus upon growth is allowed fuller play, the

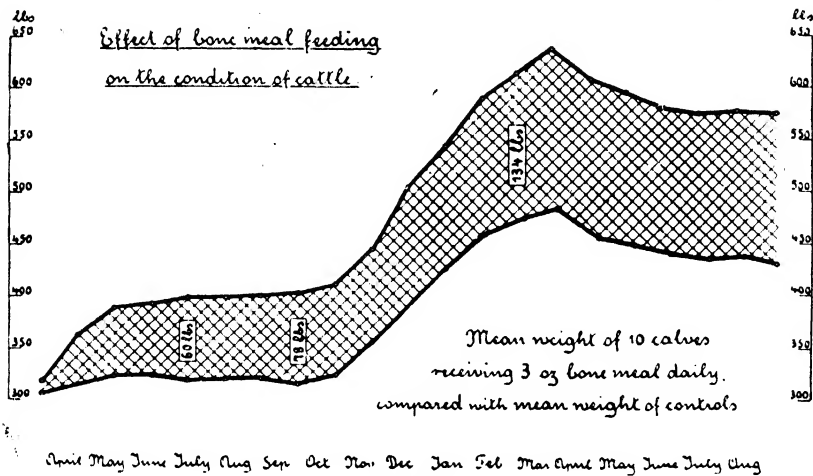


FIG. 8.

results are still more striking. Fig. 8 shows the curves obtained with calves from 9 to 18 months old, in an experiment commenced in April, 1921. These calves commenced at an average weight of 300 lb. On the quantitatively sufficient, but



FIG. 9.—Showing Influence of Phosphorus on Growth of Cattle, otherwise restricted to Natural Grazing.

Weight.	No. 518.	No. 475.	No. 502.	No. 528.
January, 1922 .. ..	310 lb.	319 lb.	304 lb.	297 lb.
May, 1923 .. ..	755 lb.	465 lb.	726 lb.	451 lb.
Increase .. ..	445 lb.	146 lb.	422 lb.	154 lb.
Bone-meal ration ..	3 oz.	Nil	3 oz.	Nil

phosphorus deficient, veld vegetation of April and May, the controls make practically no progress, while the bone-meal batch gain 60 lb. per head; 20 per cent. in two months. From June to October the amount of winter grass was sufficient to keep both lots from falling off in weight, and allow the bone-meal lot to increase their lead to 78 lb. per head. From October to April the new grass provided relatively abundant feed, of better (less deficient) phosphorus-content during the earlier period of growth, and even the controls increase to 480 lb. The bone-meal lot, however, increase to well over 600 lb., the actual superiority being 134 lb. per head. During this period there can be no doubt that the lack of phosphorus in the grass is the *limiting factor* in the growth of these calves, a fact which will presently be correlated with analyses of the grass over these months of the year.

Calculating on the basis of the initial weight of 300 lb., the actual increases are 60 per cent. for the controls, but 105 per cent. for the lot receiving the bone-meal ration; the latter having more than *doubled their weight*. The bone-meal batch also increased more in *size*, i.e., in skeletal development, so demonstrating the specific effect upon growth. As pictorial illustration of this the following photographs are of great interest. Fig. 9 shows four animals *not* selected because they make a pretty picture, but originally picked out on the basis of similarity in weight, age, and appearance, over a year before the photograph was taken. The exact experimental protocols are included in the legend to the plate.

It will be noted that No. 518 has increased more than *three times as much* as No. 475 in sixteen months, although actually the smaller animal at the commencement. No. 528 is similarly stunted by comparison with No. 502, its phosphorus-fed fellow. Subsequent experience has shown that results nearly as good can be obtained with less bone-meal than actually used in this experiment, although a liberal ration is always surer. These animals are *representative* of the general results of phosphorus feeding, now recorded for hundreds of cattle; more representative than the dramatic differences shown in Fig. 4 and Fig. 7, but sufficiently striking to convince any progressive farmer of the need for bone-meal feeding on phosphorus deficient soils. Although bone-meal is here used as source of phosphorus, wheaten bran or other palatable, digestible, phosphorus rich supplement, serves the same purpose. This point will be mentioned again in discussing the phosphorus-content of the veld vegetation. (Fig. 24.)

*Is the Amount of Phosphorus required to Prevent Osteophagia the Optimum for Growth?*—When the Armoedsvlakte feeding experiments were commenced, the two functions of bone-meal were kept in view:—(a) Prevention of lamsiekte by obviation of osteophagia, and (b) improvement in growth and condition by obviation of nutritive deficiency of the pasture. Shortly afterwards (1921) an attempt was made to measure the phosphorus requirements of different classes of animals by determining the minimum amount required to prevent osteophagia, and to estimate the phosphorus deficiency of the veld at different seasons of the year by noting the variations in amount of phosphorus required to supplement it, correlating the latter with actual analyses of the vegetation. "Osteophagia Equilibrium" experiments were then devised, in which the daily ration of bone-meal was varied every week upon the basis of a weekly test for osteophagia. If during any week the craving for bones disappeared, the daily ration of bone-meal was dropped slightly. The moment the craving returned, the ration was raised slightly. In this way the cattle were kept just on verge of osteophagia, and the actual amount of bone-meal required to maintain this "equilibrium" charted against season (or time) for cows, calves, growing stock, and adult oxen. The results are given below.

It was then found that, although osteophagia is an excellent *general guide* to phosphorus deficiency, and a *certain indication* of susceptibility to lamsiekte in presence of the other essential links in the etiological chain of that disease (Fig. 1), it is by no means infallible as a measure of the need for phosphorus in nutrition. Although osteophagia nearly always (with the exception of a few "habitual" or "chronic" cravers) indicated nutritional need for phosphorus, quite a number of animals (especially young stock) failed to display osteophagia even when their nutritional need could be readily demonstrated by a dietetic experiment. Furthermore, osteophagia only appeared (in general) at a level of deficiency distinctly below the optimum requirements from the nutritional point of view. Figs. 10 and 11 illustrate this. The animals are young calves originally selected from the stock at disposal, on the grounds of *uniformity* in age, size, weight, and appearance. They belong to a "skeletal development" experiment, and will finally be slaughtered for study of their bones. Fig. 10 compares a control receiving no bone-meal with a similar individual receiving "just sufficient" bone-meal to prevent osteophagia, and with a third, originally similar calf, fed upon "excess" bone-meal (3 oz.). The legend supplies the detailed protocols.

As will be seen, the increase in weight over sixteen months is 166 lb. for the control; 295 lb. for the animal receiving just enough phosphorus to prevent osteophagia, 15 lb. of bone-meal in all; and 352 lb. for the animal receiving excess bone-meal, 75 lb. in all or 3 oz. per day except Sundays. It is quite obvious that the amount of bone-meal required to prevent osteophagia effects an enormous improvement in growth, but is not quite the *optimum*. It has the effect of almost doubling the rate of increase, and yet a further supply allows of a further increase of 57 lb. over 295 lb., or approximately a further 20 per cent. The precise additional amount of bone-meal required to produce the optimum effect is not yet known. The actual amount supplied to No. 560 was five times as high as that supplied to No. 559. The 3-oz. daily ration is obviously unnecessarily high, and even 1 oz. (25 lb. total) might have proved sufficient to effect maximum improvement. Experiments are now in progress to determine the *most economical* amounts of bone-meal for various classes of cattle as distinct from the "most beneficial." The "bone-meal bill" is an important item with ranching farmers, who are little concerned with the manurial value of the phosphorus after the animal has done with it; and in some cases it *may* pay to take a "good return" in beef on a small bone-meal bill, rather than the "maximum return" on a higher initial outlay. The probabilities, however, are that the optimum live-weight and optimum economy will lie very close together; and

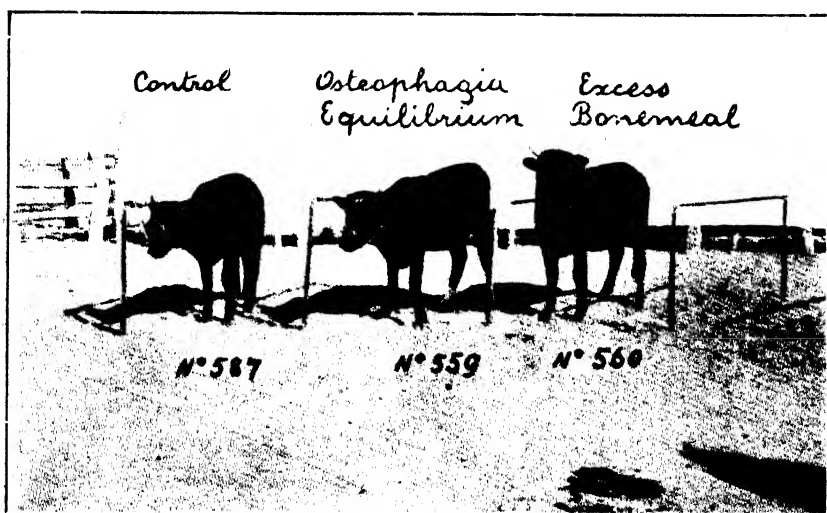


FIG. 10.—Showing that the Amount of Phosphorus required to prevent Osteophagia and so protect against Lamsiekte is not the Optimum for Growth.

Weight.	No. 587.	No. 559.	No. 560.
January, 1922 .. ..	224 lb.	237 lb.	226 lb.
May, 1923 .. ..	390 lb.	532 lb.	578 lb.
Increase .. ..	166 lb.	295 lb.	352 lb.
Total bone-meal supplied	Nil	15 lb.	75 lb.

that when the former is more accurately determined than it has been in the past series of experiments, the latter will prove close enough to render distinction superfluous.

The companion picture, Fig. 11, illustrates the second point, *i.e.*, that some animals may never show osteophagia at all, and yet profit enormously by bone-meal feeding.

The legend explains itself. Control calf No. 568, rather over a year old when the experiment started and in its third year when photographed in May, 1923, increased 225 lb. in weight in sixteen months on the natural grazing without bone-meal. No. 569 was to have got as much phosphorus as it "asked for" in the osteophagia tests; but since it *never showed craving* it never got any bone-meal. It behaves exactly like the control, increasing to about the same weight on the natural pasture, and remaining far behind No. 571, which got excess of phosphorus whether it asked for it or not. At the commencement of the experiment, No. 571

also showed no osteophagia, but being liberally supplied with bone-meal, never got a chance of developing it. Whether it would have developed osteophagia if it had not been so fed remains doubtful; probably it would not, since a fair proportion of the calves in this experiment only developed the bone-eating habit after two years. At any rate it got bone-meal (by the "crush method" described below) and made more than twice the gain in weight of either the control or the "osteophagia equilibrium" animal, which *would* have received at least *some* bone-meal if it had reflected its requirements by displaying craving.

*Requirements of Different Classes of Cattle.*—The next chart, Fig. 12, shows the varying amounts of bone-meal required to prevent osteophagia in different classes of cattle, as determined by the method of "osteophagia equilibrium" just described.

It may first be noted that the amount of phosphorus required varies with the season of the year, falling as the richer young grass of spring becomes available, and rising again as the grass matures. This point will be more fully discussed in considering the chemical composition of the pasture (see Fig. 23).

Glancing at the curve for adult oxen, it is apparent that phosphorus requirements are lowest for animals which made demands only for *maintenance*, but not for growth or reproduction. For this class of stock 6 oz. to 9 oz. of bone-meal per week provide sufficient phosphorus to prevent osteophagia, even during the worst

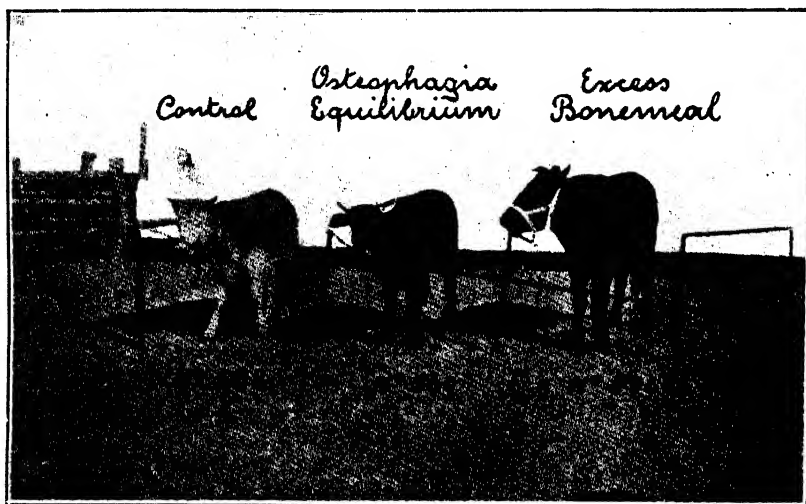


FIG. 11.—Showing that Nutritional Deficiency of Phosphorus is *not* always reflected as Osteophagia.

Weight.	No. 568.	No. 569.	No. 571.
January, 1922 .. ..	236 lb.	238 lb.	233 lb.
May, 1923 .. ..	461 lb.	472 lb.	714 lb.
Increase .. ..	225 lb.	234 lb.	481 lb.
Total bone-meal consumed	Nil	Nil	75 lb.

No. 569 received no bone-meal simply because it never showed Osteophagia.

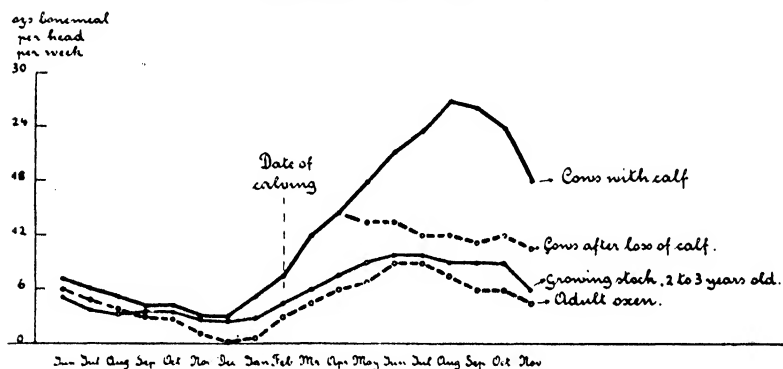
period of the year (winter grazing, May to August); while during the period of very young grass practically no bone-meal is needed, the proportion of phosphorus in the vegetation itself (Fig. 23) being then sufficient for mere maintenance.

With young growing stock the requirements are a little higher than for oxen, apparently varying from 2 oz. to 10 oz. per head per week according to the season of the year, i.e., according to the stage of growth of the grass. Expressed upon the basis of live-weight, the difference "per 1,000 lb." would be even more marked, but for the present the curves are purposely left to reflect "classes of stock" irrespective of weight: for three reasons—(1) that the ranching farmer thinks in terms of class and ~~age~~ rather in terms of individual weight, (2) that the experimental animals were "stunted" to begin with, and "potential capacity to grow" is more important than initial weight, and (3) that the ratio of "phosphorus" to "energy value" of the ~~grazing~~, which remains the same irrespective of the weight of the animal and

the weight of food eaten, is probably the most important factor (see below). The curve therefore reflects the fact that *growing stock* require slightly more bone-meal than adult oxen, in spite of the fact that the latter are larger and heavier animals; further, that they require it all the year round.

Coming now to the curve for *breeding cows*, the difference in phosphorus requirements is shown as very much greater, and it is apparent that the main demand for the extra bone-meal is for *milk production*. The first part of the curve shows that the extra demand for the early period of pregnancy is not great, the amount of bone-meal being only about 2 oz. per head per week higher than for oxen. During the last two months of pregnancy, however, the demand increases and at the time of calving is considerably higher than for oxen. Thereafter the requirements for bone-meal increase rapidly owing to the *combined factors of season and lactation*: increasing age of the grass being accompanied by decreasing phosphorus-content (Fig. 23); and milk production requiring relatively much phosphorus for the manufacture of casein, a *phosphoprotein*. In August as much as 28 oz. of bone-meal per week are required to prevent osteophagia: an average of 4 oz. per head per day, or nearly 5 oz. per "week day" if the routine of administration excludes Sundays (see below).

Variation in amount of bone-meal required to prevent Osteophagia  
with different classes of stock.



Composite chart for an average year, semi-diagrammatic,  
interpolated from miscellaneous data of  
"Osteophagia Equilibrium" experiments.

FIG. 12.

The sharp fall in the curve after July or August is to some extent due to the appearance of a few green shoots on the deeper rooted plants, but mainly due to natural *drying up of the milk flow*. About this time the calves are largely fending for themselves, and natural weaning commences. If the mothers still have sufficient milk they give it; if not, they discourage their offspring, with hoof and horn, and only the most persistent youngsters secure appreciable quantities.

If, for any reason, the cow loses her calf she naturally "goes dry" soon after, and her phosphorus requirements fall in proportion. The broken branch-line of Fig. 12, showing "cows after loss of calf," is interpolated from several cows which lost their calves from one to three months after birth. The bone-meal requirements at once diminished, and the fact that they remain higher than for oxen is probably due to the fact that the cows are recuperating a previous drain upon the system; in less measure to the fact that they may be again nourishing a calf *in utero*.

Summarising the lesson of this chart (Fig. 12) it may be stated that in general, for conditions of the Armoedsvlakte type, oxen require a supplement ranging from nil up to  $1\frac{1}{2}$  oz. of bone-meal per head per day (excluding Sundays), depending upon the season of the year and the state of the veld; growing stock  $\frac{1}{2}$  oz. up to 2 oz.; heifers much the same, but increasing to 2 oz. as they become breeding cows and rising to 5 oz. during the lactation period. This is for *prevention of osteophagia*, prevention of lamsiekte, and marked improvement in condition. For *optimum* growth and condition, the quantities recommended would be distinctly higher, and

more uniform throughout the year. Each farmer has to be guided by his own experience on his own farm in deciding how much bone-meal he can profitably feed, but as a basis upon which to work the following figures should prove a useful starting point: 1 oz. per day for calves up to 18 months; 2 oz. to 3 oz. for the remainder of the growing period; back to about half this for old oxen for mere maintenance of good condition; up to 5 oz. for cows with calf at foot. For dairy stock of *high milk yield* the owner should cheerfully go up to 8 oz. unless he is using supplementary rations containing wheaten bran; in which case he can reduce his bone-meal allowance by about 1 oz. for every 1 lb. of bran he feeds. For such stock, which give an *immediate return* in milk sold off the farm, he will find that it pays to go on increasing his phosphorus ration until he is satisfied that he is getting the maximum milk yield from cows maintained in good sleek condition. A "staring coat" at least deserves trial on a higher ration. If his cows are kraaled or stalled in such a way as to render collection of manure at all feasible, it should be remembered that a large proportion of the phosphorus goes out in the dung and that this will work wonders with any land he has under cultivation (cf. Pot. 56, Fig. 26).

*Influence on Milk Yield.*—That milk production imposes a severe strain upon the phosphorus reserves of an animal is a well-known fact. Indeed, recent American work goes to show that a lactating cow is usually in "negative phosphorus balance"—i.e., may lose phosphorus from her own reserves (skeleton) even on an ordinary

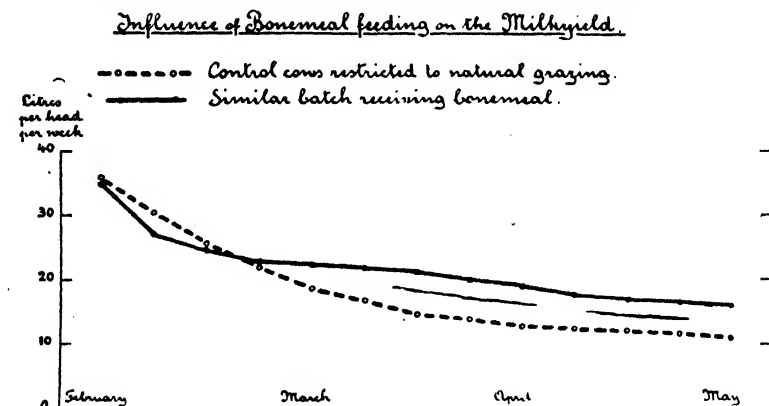


FIG. 13.

ration. On the phosphorus deficient veld of Armoedsvlakte the strain is reflected through osteophagia in the manner just discussed. On the Ermelo high veld it is reflected in the same way, but is further demonstrated by the prevalence of "styfsiekte" (stiff-sickness) amongst cows at or after calving; and by the tendency to recover from that disease if the calf is taken away and the milk flow allowed to dry up. It may, however, be demonstrated directly on the *milk yield itself*, as shown in Fig. 13.

This chart shows the *immediate effect* of phosphorus upon milk production. Ten ordinary veld cows were selected and milked from alternate halves of the udder on alternate days, leaving the other half for the calf. The data so obtained were doubled for "total yield," and preliminary records kept for a few weeks. They were then divided into two batches of five in such a way that the total yield was approximately the same for both. Both lots were restricted to the ordinary veld grazing, but one was given a ration of bone-meal (8 oz., to ensure experimental excess) and the other not. The milk yield at once responds to the phosphorus supplied, and the bone-meal batch averages about 40 per cent. more milk. Low phosphorus is therefore a *limiting factor in milk production*. The actual milk yields shown, 35 litres per week, or about 5 litres (about nine pint bottles) a day, dwindling to half this after a few months, are low owing to the nature of the stock; ordinary Afrikaner crossbreds giving merely enough to bring up their calves on the veld, and doing even this under adverse conditions of food supply. With *dairy stock* the differences would unquestionably be much more striking, when expressed in litres or gallons, and experimental data for the benefit of the dairy farmer are now being acquired. It is practically certain that these experiments will show a very substantial profit upon the monthly milk bill for every ounce of bone-meal fed.

The data of Fig. 13 only show the benefit derived by the sucking calf as an *immediate result* of feeding bone-meal to the mother. Either Fig. 4 or Fig. 7 will convince the reader of the much greater benefit derived from more prolonged phosphorus feeding. The superior heavier animal (if a cow) is obviously going to supply much more milk than the stunted one. A single year's continuous bone-meal feeding works wonders with both mother and offspring. Precise statistics in this direction are now being acquired.

*Weight and Vigour of Calf at Birth.*—Such statistics are at present limited since, as mentioned in the introduction, drought and locust depredations reduced the stock-carrying capacity of the Armoedsvlakte veld and compelled curtailment of some of the most interesting experimental work. Nevertheless, the meagre existing data point unmistakably to the fact that the calves born of phosphorus-fed mothers average from 10 to 20 per cent. heavier than calves born of controls. They are also stronger, get more milk from their mothers, and so get a *better start in life*. It is not desired to labour this point, however, since it is one of the wise provisions of nature that during the period of gestation the mother sacrifices herself for her offspring; and many a scarecrow cow throws a fine calf. This is particularly noticeable in the styfsiekte areas, where the mother develops the disease mainly through the sacrifices she makes in nourishing her calf during late gestation and early sucking. The calf usually gets along quite creditably so long as the mother's milk holds out, a real "stunting of growth" becoming manifest only after weaning, when it has itself to rely upon the veld grass on which its mother bred it. Nevertheless, in spite of the capacity for maternal sacrifice, removal of phosphorus deficiency by bone-meal feeding of the cows gives a superior crop of calves.

*Age of Maturity.*—The phrase "crop of calves" may be used to recall the "late maturity" shown in Fig. 1. With the limited data at present available the influence of bone-meal feeding upon the number of calves born per annum from a given number of cows is difficult to state with precision. The available data suggest "reduced fertility" under phosphorus deficient conditions of nutrition, even with cows which have already borne their first calf and should be capable of annual calving thereafter; but alien factors have not been excluded sufficiently to allow of simple interpretation. That phosphorus deficiency *delays growth* has already been shown, however, and a study of Figs. 7 and 10 will probably convince most readers that it also *delays maturity* in the breeding sense. The data, unfortunately, are not yet sufficiently clear-cut for charting upon a numerical basis, and the question may therefore be left for a later article.

*Quality of Meat.*—This item of Fig. 1 has already been referred to, but owing to its importance in the beef trade, is worthy of emphasis under a separate heading. As earlier photographs show (e.g., Fig. 7), phosphorus-fed cattle are much heavier, carry more meat and fat in proportion to skeleton and entrails, and therefore yield a *higher proportion* of their live-weight in the form of butcher's *dressed carcass*. In addition, they reach a profitable butcher-weight at an earlier age, their muscle-fibres are more liberally interlarded with fat, and their meat is therefore more *tender*. In short, they are nearer "prime condition" and fetch a higher price "per 100 lb. on the hoof." Indeed, the difference in *quality* may make all the difference between an animal saleable at any time on any market and an animal only saleable at all on a market short of first-grade meat. This question of *quality* is of obvious importance if South Africa is to compete on the markets of the world and realise her dream of a *beef export trade*.

## V. INFLUENCE OF PHOSPHORUS UPON FOOD CONSUMPTION.

Figs. 4 to 11, bringing out the difference in meat production effected by phosphorus feeding, at once raised a very interesting question. Do cattle receiving bone-meal *eat more food* in putting on the extra weight, or do they *utilise their food better* without actually eating more of it? The experimental data charted in Fig. 14 partly answer this question.

In this experiment the cattle had to be stabled, since it is impossible to measure the amount of grass eaten in the process of grazing. Twelve half-grown cattle were taken from the veld and divided into two lots of six, in such a way as to give the same aggregate weights; averaging, as the chart shows, about 450 lb. per head. They were then so stalled that the food eaten could be accurately controlled, and fed upon a basal ration *low in phosphorus*, but *adequate in energy value*, and of "sufficient," although by no means liberal, *protein-content*. These conditions were fulfilled by giving a fairly high *fixed ration* of flaked maize, so-called "Fanko," a high-grade rolled maize endosperm sold for human consumption, and selected on account of its very low phosphorus-content as compared with its relatively high energy value (0.01 P<sub>2</sub>O<sub>5</sub> per unit starch equivalent). Taff hay of fair quality, but lower than usual

in phosphorus-content (varying around .16 per cent.  $P_2O_5$ ) owing to its origin from phosphorus-poor soil (Ernello District), was then supplied *ad libitum* from over head racks, and the amount voluntarily eaten duly recorded. Both lots were treated in exactly the same way except for the supplement of 3 oz. bone-meal per head per day, to vary the phosphorus-content;\* the periods of bone-meal feeding being indicated on the chart (Fig. 14) by continuous lines, as against dotted lines for periods during which no bone-meal was supplied. Since the hay was offered *ad libitum* the phosphorus intake of even the control cattle varied throughout the experiment, but since the fixed ration of fanko always contributed a considerable proportion of the total diet the cattle receiving no bone-meal always got *too little phosphorus*. Records for osteophagia and live-weight are also shown on the chart for

*Influence of Phosphorus*  
*upon Food Consumption, Osteophagia and Weight.*

Continuous lines — 3 oz bone meal daily, average of 6 growing cattle.  
Broken lines - - - - - no bone meal ; , average of 6 controls.  
Ration { Flaked Maize (Fanko), low phosphorus content, fixed amount,  
Hay, low phosphorus content, *ad libitum*.

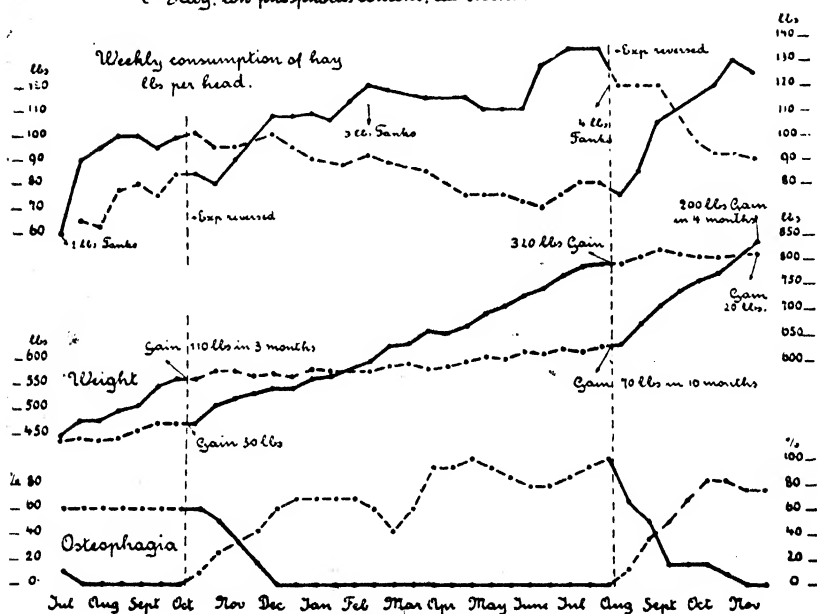


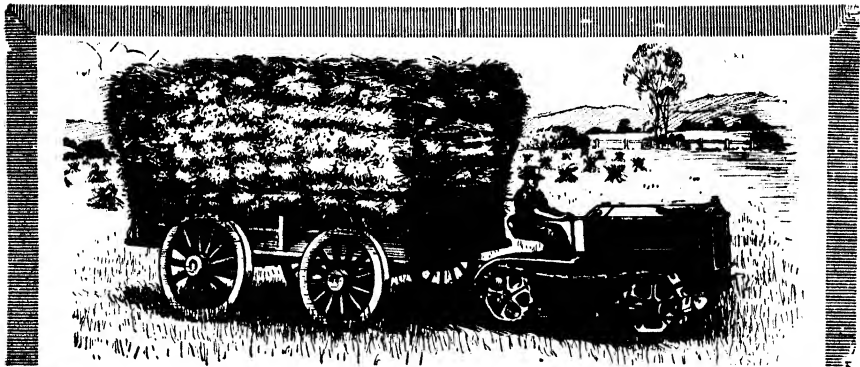
FIG. 14.

the whole period of experiment. The detailed protocols will be considered in a more technical paper, but even in a popular article the following features of the curves may be emphasised:—

(1) The cattle receiving bone-meal eat more hay, increase more in weight, and lose their osteophagia. For the first three months the controls retain their osteophagia, gain only 30 lb. per head in weight, and eat from 60 to 80 lb. of hay per head per week, or about 10 lb. of hay per day in addition to the 2 lb. of fanko. The cattle receiving bone-meal promptly lose their craving, eat 90 lb. to 100 lb. of hay per week, or about 4 lb. more per day, and gain 110 lb. per head in weight—practically four times as much as the controls receiving no bone-meal.

(2) At this point (October, 1922), the experiment was "crossed" in order to make quite sure of excluding potential idiosyncratic differences between the two groups—i.e., the bone-meal was taken away from one lot and given to the other lot. The effect is very striking. Within a month the osteophagia curves and hay consumption curves cross—i.e., the osteophagia returns and the food consumption diminishes in the lot from which the bone-meal was taken away; while osteophagia disappears and food intake rises in the lot to which the bone-meal ration was transferred.

\* NOTE.—Other minerals sufficient in basal ration.



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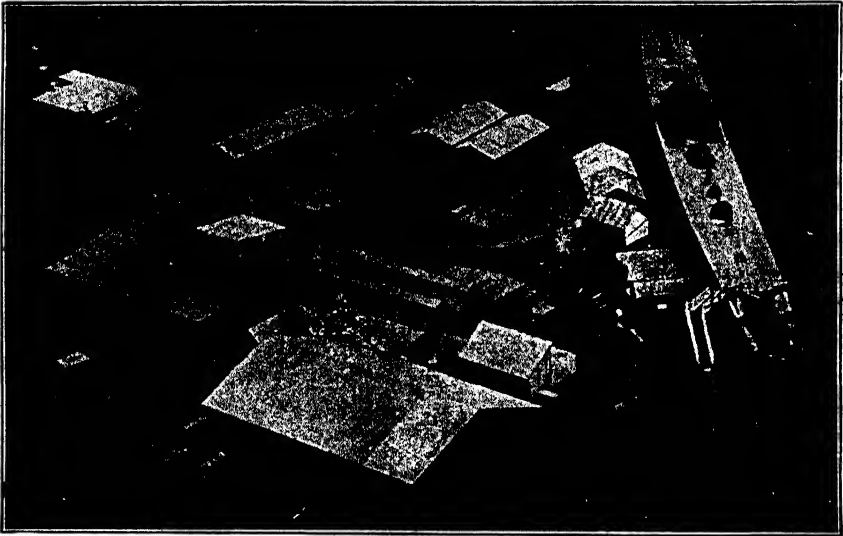
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The weight curves respond in the same direction, and within four months the previously inferior controls have not only made up their leeway of 80 lb., but have actually surpassed the lot deprived of bone-meal. At the end of ten months they have gained 320 lb., or more than four times as much as the previously superior batch. Indeed, the latter remain almost stationary in weight for a considerable portion of the time.

(3) The experiment was then *crossed again*—i.e., the bone-meal once more transferred from one batch to the other. The same behaviour is again shown. The “osteophagia” and “hay consumption” curves again cross in a few weeks, and the “weight curves” in a few months. The rate of increase in weight of the lot now deprived of bone-meal at once drops; indeed, only continuing to rise by 20 lb. over the first few weeks after the change, and then remaining practically stationary; so suggesting that the phosphorus in the basal ration was sufficient for bare maintenance, but not sufficient for growth or fattening. On the other hand the rate of increase in weight of the other batch, formerly without bone-meal, rises the moment bone-meal is given, and a gain of over 200 lb. is made in four months.

(4) The weight curves over the whole period of seventeen months thus indicate quite clearly that phosphorus (bone-meal) is a *limiting factor in growth* and also a limiting factor in “voluntary food consumption,” or “appetite.” Taking the upper curve (initially), it is noted that so long as phosphorus is adequate the average increase of the six cattle is 37 lb. per head per month from July to October, a normal increase for mongrel stock when the indifferent character of the diet is considered. With a better class of stock (beef breed) and a more varied diet, richer in protein, the rate of increase would naturally be much higher. When bone-meal is *withdrawn* this 37 lb. per month drops to 7 lb. per month—i.e., the growth rate is reduced to *one-fifth*. Once more inserting the bone-meal ration, the rate of increase develops to 50 lb. per month, or over *sevenfold*. The fact that the rate from August to November, 1923, is about a third *faster* than in August, 1922, in spite of the fact that the cattle are now a year older, is interesting from the point of view of “retention of the capacity to grow.” It looks just as if the “growth impetus” had been “held in check” over the whole year on the phosphorus deficient ration, and then “suddenly released” the moment the missing phosphorus was supplied, the subsequent enhanced rate of progress almost suggesting an attempt to make up for lost time.

The corresponding curve for hay consumption of this batch shows that, although more hay was certainly consumed during the periods of most rapid increase, the difference is *not sufficient to account for the extra body weight put on*. This is not quite so obvious from the long period of ten months during which the bone-meal batch were increasing, roughly, 1 lb. per day faster than the controls and eating, roughly, 5 lb. more hay per day in doing it, but is strikingly apparent for the last period, August–November, 1923. Dividing this period according to the week in which the food consumption curves crossed, the protocols are as follows:—

Actual hay eaten per head in addition to fixed ration of 4 lb. fanko				Live Weight.			Average per head.		
	14th Aug. to 2nd Oct.	2nd Oct. to 27th Nov.	Total.	14th Aug.	2nd Oct.	Increase.	27th Nvo.	Further Increase.	Total Increase.
	lb.	lb.	lb.	lb.	lb.	lb.	lb.	lb.	lb.
Lot A ..	724	956	1,680	625	750	125	835	85	210
Lot B ..	935	770	1,705	790	810	20	810	Nil.	20

FIG. 15.

It will be noted that between 14th August, when the bone-meal was taken away from Lot B and given to Lot A, and 2nd October, when the hay consumption curves cross, Lot B still continued to eat more hay, but only gained 20 lb. per head in weight, as against 125 lb. gained by Lot A eating 211 lb. *less* hay over the eight weeks. By this time the weekly hay consumption of Lot A had increased as that of Lot B diminished, so that in the following eight weeks the position is reversed, Lot A eating a total of 956 lb. per head as against 770 lb. for Lot B—a difference of 186 lb. of hay, accompanied by an increase of 85 lb. in live-weight. Over the whole period of sixteen weeks, however, Lot A have actually eaten 25 lb. *less* total hay than Lot B, but in this short time have not only made good their August arrears of 165 lb. in

body-weight, but actually show a gross gain of 210 lb. per head, passing Lot B by an average of 25 lb. There seems to be no escape from the conclusion that phosphorus-fed animals utilise their food better and put on more body weight per unit of food consumed.

In both cases the average energy value of the food is well above maintenance requirements. Taking even the last period during which the weights of the two lots were similar, Lot B consumed an average of 16 lb. of hay per day as against 16.8 lb. for Lot A. Adding the fixed ration of 4 lb. of fanko, completely consumed by both lots, the difference in total "fuel value," or "food value," of the two diets becomes very small. Making a conservative estimate from analyses of the ration, the "starch equivalent" for Lot A works out at about 8.8 lb. per head per day and for Lot B at about 8.5 lb.; or expressing it in terms of cereal for the benefit of the farmer, it may be said that Lot A ate a ration equivalent in food value to 49 lb. of maize-meal per week, while Lot B ate the equivalent of 47 lb. per week. The difference is small and both are obviously well above ordinary living requirements for animals of 800 lb. live-weight. There would, therefore, seem to be no escape from the conclusion that while Lot B maintained their weight constant over the period concerned, they actually ate food in considerable excess over maintenance needs, simply "combusting" the extra ration for no useful purpose; whereas Lot A, using roughly the same excess food, used it profitably for carcass increase at the rate of  $1\frac{1}{2}$  lb. per head per day.



FIG. 16.

Mere "structural" requirements of phosphorus, for skeletal and general tissue development, could hardly account for the magnitude of the difference involved, an increase of 210 lb., or 33 per cent. in sixteen weeks, a good deal of which is fat. It therefore appears highly likely that phosphorus plays a specific role in cellular metabolism; has indeed what might well be called a *vitamin* effect, which facilitates utilisation of carbohydrate and protein in general tissue anabolism. One need only compare the behaviour of these cattle with that of laboratory rats on a diet deficient in vitamin B, stunted growth rapidly becoming normal the moment the missing factor is supplied. And after all, *what is a vitamin?* It has been defined as something which is necessary for life and health, but which does not necessarily contribute either to the structural framework or dynamic requirements of an animal. Phosphorus happens to contribute very largely to the structural framework, but it would seem to have a function quite apart from its use as a "building stone"; a function highly reminiscent of that which is commonly associated with the conception of the term "vitamin." This point is now being worked up in some detail, but provisionally it is not unreasonable to assume that a "growth impetus" responding with a weight increase of 125 lb. in seven weeks (Fig. 15), after being held in abeyance for ten months (Fig. 14), predicates more than a mere structural use of phosphorus; predicates a functional use in intermediary metabolism. As providing an analogy for the "functional" as distinct from the "structural" utilisation of phosphorus compounds, one might refer interested readers to the recent American work of Meigs

and Blatherwick. These authors adduce evidence to show that circulating "phosphatids" play an important part in the synthesis of caseinogen and fat in milk, quite irrespective of the personal requirements of the mammary gland itself. Why should phosphorus, in one form or another, not play an equally important part in the intermediary metabolism of protein and fat for all cells of the body, irrespective of their demands for phosphorus compounds as units in their framework?

But this is digression. The farmer is not interested in such speculation, and for him the lesson in Fig. 14 may be more simply stated:—*Cattle on a phosphorus deficient diet do not utilise their food economically. Even if they eat a lot they waste it, and do not give a profitable return in live-weight for it. If the deficiency is rectified by bone-meal feeding, they may eat more, but give a much better value in beef for all they eat.*

In passing it may be added that although the cattle of Fig. 14 did actually eat very much the same in terms of "calories" (energy, or heat, or, broadly, "food") during the last period of the experiment, it by no means follows that they would have done so under ordinary conditions of veld grazing. After all, even when without bone-meal they were "coaxed" by the fixed ration of fanko—i.e., much food in small bulk. After polishing off the 4 lb. of this flaked maize, they presumably proceeded to fill their bellies comfortably with hay. If they had been dependent solely upon sparsely distributed poor grass, it is highly probable that the failing appetite of the phosphorus deficient batch would then have stopped short at consuming the bare amount required for mere maintenance. The fact still remains, however, that in this experiment, whether coaxed or not, they did actually eat more than required for maintenance; and did to all appearances digest all their food; and did, therefore, waste the excess quite literally in *gas* (carbon dioxide through the lungs), instead of utilising it, as did the phosphorus efficient batch, to form carcass increase.

## VI. METHODS OF BONE-MEAL FEEDING.

Presuming that readers are now convinced of the advantages of feeding bone-meal, the present stage is perhaps suitable for indicating the methods generally adopted. Each farmer must be guided by his own experience in handling his own stock under the varying conditions of his own farm, but the following methods will be found serviceable:—

(1) *Along with other food.*—If supplementary rations are fed, as in the case of dairy cows and high-class stock, the simplest way is to mix the bone-meal ration with the concentrates. This method can easily be adjusted to individual cases—e.g., the giving of most bone-meal to the heaviest milkers.

(2) *In troughs.*—The best way is to use a large number of small, cheap wooden troughs, so that each animal gets its share, and so that stronger animals cannot rob weaker animals. The simplest device is to construct kraals at the watering-places and pass the animals through these on their way to or from water. If twenty animals are passed through at a time, and twenty-one or twenty-two troughs supplied, each animal will immediately secure its ration and pass on. Another dose of bone-meal can then be emptied into each trough by a single operator, and the next lot of cattle passed through. The animals very soon learn what the troughs are for, and make straight for their bone-meal, so that no time is wasted. A few licks suffice to finish the ration of a few oz., and if the troughs are properly spaced, even the weaker animals manage to gulp down their allowance before stronger animals can rob them. Fig. 16 illustrates the method as originally practised at Armoedsvlakte.

Instead of using troughs, some farmers find it sufficient to place the ration in little heaps on the ground. The animals can be educated to run to the same spot each day.

(3) *By the "crush" method.*—In place of small troughs, it is often simpler to construct a long "crush"—i.e., a double fence similar to that used as approach to dipping tanks. If the crush is just wide enough to allow animals through in single file, and is placed at the entry or exit of a kraal surrounding the watering-place, it becomes a very simple matter to dose each animal as it passes through. The animals like the bone-meal, and dosing is very simple. Fig. 17 illustrates one of the crushes used at Armoedsvlakte.

After a little experience the cattle get to know their job and actually put their heads over the side of the crush in anticipation of the bone-meal, as shown in Fig. 18.

If large spoons, or cigarette tins marked off in "oz. of bone-meal" are used, the dose can be varied according to the individual animal, and maximum economy effected. As an old ox comes along, he gets 1 oz., or even 3 oz., if he is known as a bad craver;

a growing steer or heifer is easily supplied with 2 oz.; a lactating cow with 5 oz.; and so forth, according to the experience of the stockmen. By this method, it is possible for one expert white man, with a native assistant and a "piccanin" to hold the bone-meal bucket to dose up to 200 animals an hour. Fig. 19 illustrates the method, as practised at Armoedsvlakte.

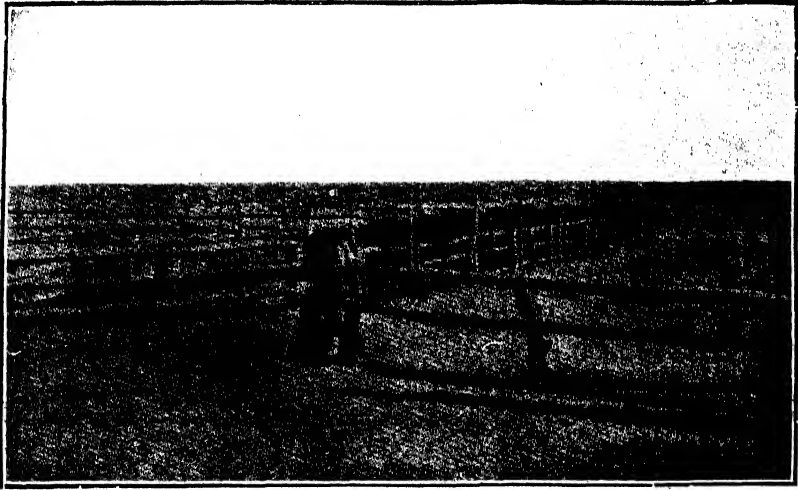


FIG. 17.

It is best to damp the bone-meal, or work it into a porridge with water, in order to prevent blowing about by wind. For the porridge form, a large tablespoon is useful. A few trials give the number of ounces per spoonful. The native assistant holds a horn and pulls the tongue aside, while the white man wipes off the dose on the back of the tongue. The animal blinks contentedly and passes on as if given a sweetmeat. This method is the ideal one for a rancher who has to handle thousands of cattle round relatively few watering places. If the camping system is such that only one

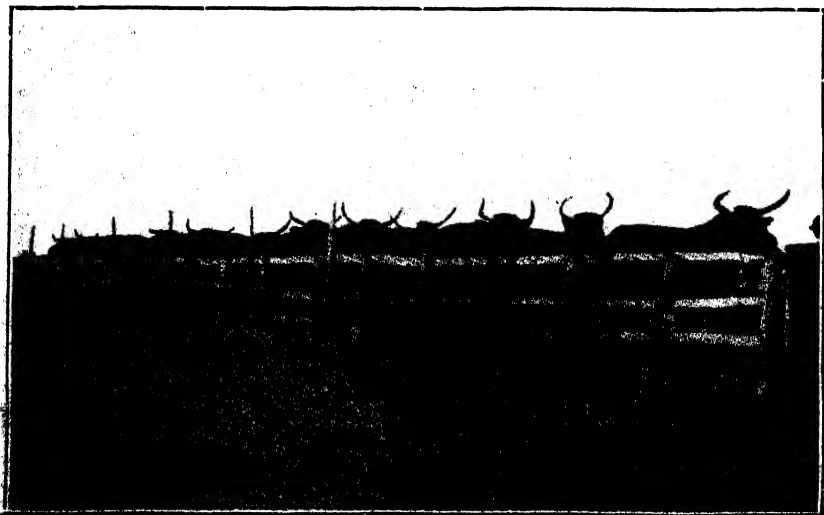


FIG. 18.

native herd-boy is available for one batch of animals, the system has to be modified to suit requirements; as, for instance, by placing the ration in a trough at the end of the crush and giving each animal time to finish its allowance before passing out. The point to be emphasised is that cattle *like* bone-meal and can be readily trained to take it by any system of dosing. Bone-meal "bisenits" are worth a trial in some cases.

(4) *As a lick*.—This is perhaps the easiest method, but it is the one most wasteful of bone-meal, since some animals will consume very large quantities if they have free access. There is one gourmand in the Armoedsvlakte herd who regularly helps himself to over 4 lb. of bone-meal at a session, when allowed unlimited access. It is quite a serviceable method, however, when the farmer does not mind using a large amount of bone-meal and treats all excess consumption as fertilising his pasture. If this method is used, it is still advisable to use a fairly large number of troughs, and it is essential to keep them constantly replenished, so that the weakest animals always get enough.

In general, it is advisable to give bone-meal as such, and not mixed with salt, the salt ration being given in separate troughs in the usual way. Many farmers prefer to mix bone-meal and salt together as one lick, but since the craving for the two



FIG. 19.

does not run parallel, and some cattle will adjust the amount they eat to their taste for salt, there is always the risk of their getting too little bone-meal. By keeping the bone-meal separate the amount supplied can be varied according to experience of the needs of the stock on any particular farm. If, however, the farmer still prefers to mix as one lick, the proportion should generally be two of bone-meal to one of salt, and never less than one off bone-meal to one of salt.

*Frequency of Feeding*.—Wherever possible the attempt should be made to feed the bone-meal every day except Sundays. If this is impossible, administration on alternate days—*i.e.*, three times a week, may be adopted. Feeding at longer intervals is of much less value and often does very little good at all. The reason for this is that the animal cannot store phosphate to any great extent, and that large doses at long intervals are not properly digested, but pass out in the dung. Hence every effort should be made to give the ration *at least* three times a week, and preferably oftener. Experiments have been carried out at varying intervals of feeding, and although the results are not charted here, it may be emphasised that it was found practically impossible to prevent osteophagia by feeding once a week, however much bone-meal was then given; and that even bi-weekly feeding proved wasteful and ineffective. At Armoedsvlakte, feeding, generally "dosing by the crush method," is conducted as a *daily routine*, Sundays being omitted in order to give the stockmen the usual day of rest. The question of feeding phosphorus compounds other than bone-meal is discussed under Fig. 24 below.

## VII. DEFICIENCY OF PHOSPHORUS IN THE VEGETATION.

As mentioned earlier, the logical order of discussing Fig. 1 might well have been taken from mother earth as starting point; thence through the vegetation, and thence on to the effect upon the animals eating that vegetation. The order of interest to the stock farmer, however, is probably that actually adopted, taking first the effect of phosphorus deficiency upon the animal and leaving the less interesting considerations of soil composition to the end. There remain, therefore, the data upon phosphorus deficiency in vegetation and soil to be linked up to the defective nutrition of the animal.

Going back to Fig. 1, the following analyses of mixed grasses cut from the Armoedsvlakte veld at different times of the year are of interest. A considerable proportion of the total vegetation consists of bushes and of plants rarely eaten by stock, but since the main food of the grazing cattle is derived from the grasses, only the analyses of these need be considered:—

*Proximate Analyses of Dry Matter of Armoedsvlakte Mixed Grasses.*

Date.	Crude Prote'n.	Ether Extract.	F-Free Extractives.	Crude Fibre.	*Ash.	P <sub>2</sub> O <sub>5</sub> .	*CaO.	Estimated energy value, Starch = 100.	Ratio of Starch equivalent to P <sub>2</sub> O <sub>5</sub> .
	%	%	%	%	%	%	%		
10th Nov., 1919 ..	19.4	5.5	41.0	22.5	11.6	.60	.31	56	100:1.07
8th Dec., „ ..	14.3	5.6	46.8	25.6	7.7	.32	.59		
15th Jan., 1920 ..	13.8	5.5	48.0	25.0	7.7	.22	.50	52	100:0.42
4th Mar., „ ..	7.2	3.4	49.8	33.7	5.9	.24	.43		
19th April, „ ..	4.9	2.4	51.6	35.0	6.1	.11	.46	32	100:0.33
11th May, „ ..	4.1	2.2	52.9	34.9	5.9	.07	.50		
8th June, „ ..	4.0	2.0	53.7	33.1	7.2	.09	.59	25	100:0.36
European figures for comparison.									
Rich pasture grass	20.5	4.6	45.9	19.0	10.0	.7	.9	60	100:1.16
Poor meadow hay	8.7	1.7	44.8	39.0	5.8	.4	.9	22	100:1.81

\* Figures for Ash and CaO variable owing to contamination with dolomitic dust.

The data are expressed upon the *dry matter* of the plant—i.e., after removing the moisture in a warm oven, in order to simplify comparison of feeding value and of phosphorus content.

The very young green grass of early spring (October to November), it will be noted, is highly nutritious and has a fairly high phosphorus content, but after the seed has fallen (April to May) the general feeding value, or “energy value,” is reduced to less than half, and then approximates that of a poor European hay. The most striking feature, however, is the extraordinary low phosphorus content, averaging about .08 per cent. P<sub>2</sub>O<sub>5</sub> or only one-fifth of that present in ordinary European hays. As the grass matures, carbohydrate formation in the plant proceeds so much faster than phosphorus absorption from the soil that the percentage of phosphoric oxide rapidly falls. The osteophagia, or craving for bones, illustrated in Fig. 2, is directly attributable to this; and the feeding of any suitable phosphorus compound rectifies the deficiency in such a way as to effect the miraculous improvement in growth and condition illustrated in Fig. 7, so long as there is grass enough to ensure a “full belly.” In spite of the low general nutritive value of the winter grazing, the cattle can, provided there is *enough of it*, generally get through the winter without serious loss of weight, as shown by the lower curve of Fig. 8. Owing, however, to the fact that the soil is poor and shallow, and the rainfall low and seasonal, the grass covering of the veld is scanty. The vegetation grows in tufts surrounded by bare soil, and its “shade area” is considerably less than one-fifth of the total soil area. Fig. 20 gives an impression of the Armoedsvlakte veld calculated to depress any European observer. Fig. 21 shows cattle grazing over what is for Armoedsvlakte a good supply of grass.

The prevalence of bushes and the stony dolomitic soil are quite well shown. Fig. 22 shows a closer view of the food the cattle subsist upon and illustrates the tuft habit of growth with the bare soil patches between. All three photographs are from the collection of Dr. I. B. Pole Evans.



FIG. 20.—Armoedsvlakte Veld, 19th March, 1917.  
*Aristida congesta*, with *Grewia incana*.

In a bad year, of subnormal rainfall, the available grazing during the dry winter may be so scanty that cattle have to expend much energy in roaming far from the watering-places (windmills and boreholes or wells) in search of food. Under such conditions the balance between energy derived from the poor quality grass, and energy



FIG. 21.—Armoedsvlakte, 19th March, 1917. Green. Luxuriant.  
*Aristida* and *Eragrostis* veld, with *Grewia incana* and *Tarchonanthus camphoratus*.

expended in getting it, may be a negative one; so that loss in condition amounting to 15 per cent. of body weight during the winter is by no means uncommon amongst the herds of Bechuanaland farms. This "quality factor" is clearly brought out in Figs. 5 and 6. As mentioned under Fig. 5, a mixed herd may easily drop from 800 lb. per head to 700 lb. per head during the rainless winter months. If the rains are delayed much beyond the usual date, pronounced starvation, and even death from

"poverty," is not uncommon. In areas of higher or more evenly distributed rainfall the "quantity factor" of the grazing is more constant, and in such cases phosphorus deficiency of the grass may be the sole limiting factor in growth and condition of stock. Such areas are not uncommon over well-watered but heavily-leached soils in Natal.

In regard to the phosphorus deficiency shown in the foregoing table, it must be remembered that interpretation of analyses cannot be made merely from the "percentage  $P_2O_5$ "; but that the general feeding value of the vegetation must be considered at the same time. Since even the phosphorus of fully ripe hay is moderately well utilised by cattle, the ratio of "starch equivalent" to "phosphoric oxide" forms a better guide to the phosphorus deficiency than the actual percentage of phosphoric oxide itself.\* Broadly speaking, the naturally grazing animal adjusts its food intake to its requirements for energy purposes and, as the grass deteriorates in value, does its best to make up for poor quality by eating increased quantity. With increased quantity of grass comes increased total phosphorus, so that a low "percentage  $P_2O_5$ " on a grass of low "fuel value" is much the same as a higher percentage in a better quality grass. This mode of expression "S.E.:  $P_2O_5$ " is adopted in the last column of the table of analyses, and renders it easy to realise that,

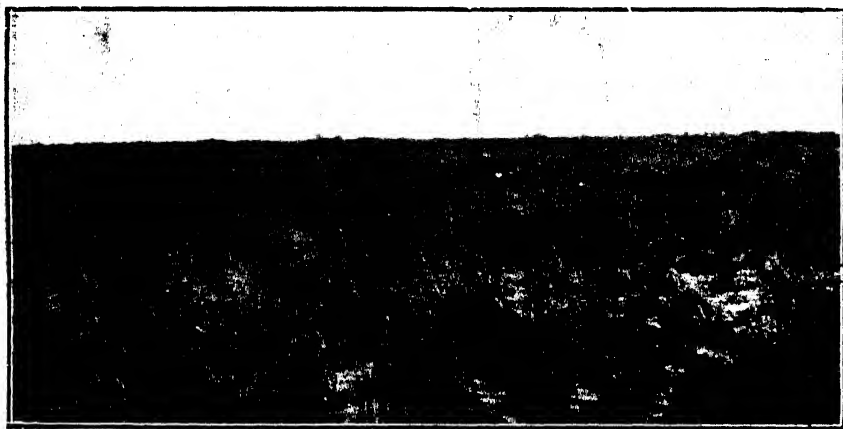


FIG. 22.—Armoedsvlakte, 4th May, 1916. Veld Green. Grasses in Flower. A fairly good year.

except for the period of young shooting spring grass, the Armoedsvlakte veld is deficient all the year round. The very young grass of early November has a ratio figure of 1.07  $P_2O_5$  per 100 Starch Equivalent, not far below that of European pasture; but the rapidly-growing green grass of January, still highly nutritious and containing 13.8 per cent. of protein, is already down to 0.42 "energy-phosphorus ratio"—a figure well below the phosphorus requirements of the animal, and therefore productive of osteophagia and stunted growth. Without definitely asserting a minimum phosphorus figure for normal nutrition of cattle, the ratio 100:0.8 may be indicated as probably fairly near the truth. Such a figure would at any rate explain why phosphorus deficiency is practically unknown in Europe, and yet prevalent over an enormous acreage of South Africa.

\* NOTE.—"Starch Equivalent" is, of course, simply the number of lb. of starch which is equal, as a source of energy, to 100 lb. of the food considered, and therefore forms a convenient measure for comparing different foods. Maize or oats could just as well be used as standard for comparison, but since such materials vary in composition and the staple cereal varies in different countries, it is better to take a pure compound like starch or sugar as unit. A still better unit is the "Calorie," the physical unit of heat, but the term "starch equivalent" is perhaps more easily understood by the South African farmer. "Phosphoric Oxide,"  $P_2O_5$  is, of course, the common expression used in comparing the amounts of phosphorus in different manures under the Fertilisers Act, and being familiar to the farmer is used here.

*Seasonal Variation of Phosphorus Deficiency in the Grass as reflected by Osteophagia in the Cattle.*—As just mentioned, the very young grass of early spring does, for a short period, contain sufficient phosphorus for normal nutrition. The period, however, is very short, and in general the cattle do not secure sufficient of this very young grass to benefit in any striking way. The practice of the country, wasteful, but nevertheless necessary in regions of cheap uncultivable land, is to destroy the old standing grass of the preceding year by *burning* the veld. Part is left unburned to provide food remnants until the rains bring on the young green vegetation over the “burns,” and the cattle are then transferred to the “burned veld.” The new season’s growth of “unburned veld” is therefore admixed with old grass of the preceding year. For the brief period of very young phosphorus-rich Spring growth, the extent to which the cattle receive an adequate “phosphorus intake” depends upon the proportion of new to old grass—i.e., partly upon the proportion of burned to unburned veld. By the time the green grass over the burns is really abundant, most of it has reached the stage at which the percentage of phosphorus is rapidly diminishing. In practice, therefore, it usually works out that the veld is really *phosphorus* deficient the whole year round, but is not quite so bad in spring. Fig. 23 illustrates this, a chart correlating rainfall, phosphorus content of the vegetation, and extent of osteophagia, over the years 1919 and 1920. Osteophagia is here, as in Fig. 12, utilised as clinical symptom reflecting phosphorus deficiency in the animal.

In reading this chart it may be explained that rainfall is recorded as weekly totals on the scale indicated; phosphorus in the dry matter of the grass (dotted line) by weekly or fortnightly analysis of samples cut from a small paddock reserved for the purpose; osteophagia tested weekly by the method already described, and charted as percentage of the herd which showed craving for “rotten bones.” The sequence of events is easily read from the curves. When the observations commenced in August, 1919, the veld showed so little green growth that grazing was confined to the old standing grass of .08 per cent.  $P_2O_5$  content. At this time 75 per cent. of the herd, recently introduced on the farm, showed osteophagia. Over the next two months the proportion of young green vegetation increased sufficiently to supplement the old grass appreciably, and there is a slow reduction in the extent of osteophagia, down to 50 per cent. During October slight rains fell, too small to be recorded separately on the chart, and therefore recorded as total for October. These were sufficient to bring on the new green grass of the *burned veld* to the point at which the cattle could subsist very largely upon it. As the dotted line shows, this young grass contained 0.6 per cent.  $P_2O_5$  (expressed on the *dry matter*) and the response of the cattle was immediate. In four weeks the osteophagia had practically vanished. On 1st November heavy rain fell, nearly three-quarters of an inch, followed by lighter rains during the following week, but by almost complete drought and blazing sun for the ensuing six weeks. The effect of this was initial rapidly falling phosphorus-content, followed by partial wilting. Osteophagia promptly returned. The heavy subsequent rains of January and February effected only a slight transient reduction of osteophagia, since during this period the grass was growing rapidly, and its average phosphorus-content fluctuating towards the lower percentage characteristic of older plants. It is interesting to note, however, that further stimulation of very young growth by the later rains, did effect slight increase of phosphorus in the “average pasture,” accompanied by slight reduction of osteophagia in February. Thereafter the phosphorus content of the grass fell steadily, and the extent of osteophagia remained consistently high for the rest of the year; right up to the following July and August when the deeper rooted vegetation (edible bushes) again began to show incipient green growth. In this year (1920), the herd, for various reasons, had to subsist upon *unburned veld*, i.e., a mixture of the new season’s growth with material qualities of old standing grass of the previous year. The *average* phosphorus-content of the total vegetation of course increased with the new season’s growth, but owing to dilution with the old grass never exceeded 0.25 per cent.  $P_2O_5$ . Accompanying the rise to this figure came a corresponding fall in the extent of osteophagia to about 35 per cent.; chiefly manifested by the oxen and older growing stock and not at all by cows with suckling calves.

The two curves for the whole period of two years thus show:—

- (a) That the extent of osteophagia in cattle varies *inversely* as the proportion of phosphorus in the grazing.
- (b) That phosphorus deficiency is manifested the whole year round, but is least acute during early spring, and may indeed almost disappear for a very short time if sufficient of the very youngest new growth becomes available for the stock.

The last proviso is, however, rarely fulfilled in practice. A farm is usually stocked according to its “carrying capacity per morgen” averaged over winter and summer. Hence at the period of incipient green growth of high phosphorus content,

Seasonal variation of Phosphorus and of Osteophagia.

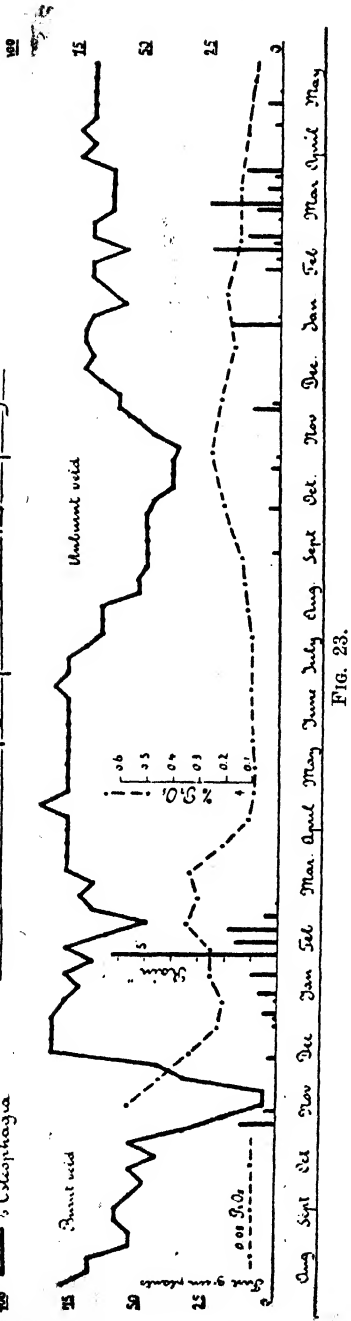


FIG. 23.

Effect of feeding various forms of Phosphorus.

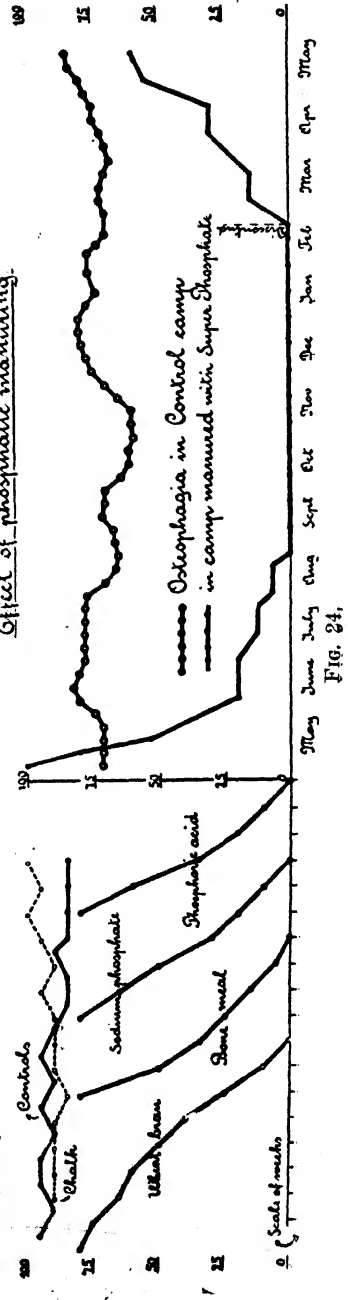


FIG. 24.

the new vegetation is not yet capable of supporting all the cattle. As the new grass develops to the point of supporting the whole herd, independently of the old grass of the preceding year, it also diminishes in phosphorus content. The broad result therefore is that the cattle suffer from phosphorus deficiency all the year round; and continuous bone-meal feeding, varying somewhat with the season if desired, is therefore recommended.

*Effect of feeding Various Forms of Phosphorus.*—The next chart, Fig. 24, shows the effect upon osteophagia of supplementing the deficient vegetation, either directly through the mouth by feeding various phosphorus compounds, or indirectly by phosphatic manuring of the pasture.

The curves on the left show the rapid reduction of osteophagia produced by feeding four representative phosphorus compounds; wheat bran supplying phosphorus in organic form associated with relatively little other mineral matter; bone-meal supplying it in the form of calcium phosphate; sodium phosphate supplying it combined with another base; phosphoric acid eliminating the base altogether, and thus pinning down the deficiency quite definitely to phosphorus and to nothing else. It may be added that phosphoric acid is *not* a good form of phosphorus for practical use since, being a "fixed acid," it tends to disturb the base-acid equilibrium of the body. The best and *cheapest* form is bone-meal, which has the added advantage of being *palatable*, of satisfying the specific craving, and of offering least trouble in administration. Many others, including ground rock phosphate, have been tried, but have either proved too costly or too difficult of digestion, and in some cases (superphosphate) productive of digestive disturbance. Ground mineral phosphates are cheaper, but so much less effective that they cannot compete with bone-meal. *Precipitated* calcium phosphate behaves very like bone-meal, but is more expensive, tasteless, and more troublesome to administer; especially since the cattle do not "recognise it" and do not take it of their own accord. Bran is of course excellent but expensive. The phosphorus contained in bran and in bone-meal can be treated as about equally available in digestion, and the two sources therefore evaluated on the basis of their phosphorus content; 1 oz. of bone-meal being as useful in rectifying phosphorus deficiency as about 1 lb. of average South African wheaten bran. Owing to the high cost of bran "per unit of phosphorus," it only comes into consideration in practice when a definite value is placed upon it as an ordinary supplementary feed in a mixed ration, *e.g.*, for dairy cows.

For cattle reared under South African ranching conditions, and expected to earn their living exclusively on the veld, bone-meal is always recommended. The quantities to feed have already been dealt with, but in connection with Fig. 24 it may be added that the *time* taken to remove osteophagia is usually six to eight weeks when 3 oz. per head per day are used for oxen or growing stock, and 6 oz. for cows. This time can be further reduced to about three weeks by feeding large amounts such as 1 lb. per day. It is a good plan to start off on this liberal scale whenever it is desired to cut short an outbreak of lambsiekte. As soon as the osteophagia is reduced, it of course pays to drop down to the smallest amounts which hold the craving in check and give satisfactory returns in beef production.

From the two upper curves on the left of Fig. 24 it will be seen that the control cattle and the cattle receiving *chalk* maintained their high craving throughout the whole period during which the phosphorus-fed cattle rapidly lost osteophagia. Indeed, during the latter part of the period the chalk-fed animals actually showed increased osteophagia, thus contradicting the practice of some farmers of mixing lime with bone-meal. There is no deficiency of lime in the Armoedsvlakte vegetation, and added lime probably decreases the availability of food phosphorus during digestion. Moreover, all sorts of other compounds have been tried—Epsom salts, Glauber's salt, iron sulphate, sulphur, and a variety of others. So long as phosphorus is absent nothing is gained, and osteophagia does not disappear until a phosphorus compound in digestible form is supplied. "Abnormal craving," or "pica," or "osteophagia" in the cattle of these areas is definitely due to phosphorus deficiency and not to deficiency of anything else. The farmer should entertain no illusions about this and should leave "proprietary licks" alone, in favour of the much cheaper and more effective bone-meal.

*Effect of Phosphatic Manuring.*—The curves on the right of Fig. 24 show that the same results can be obtained by *manuring* the pasture with available phosphate. In the experiments here recorded, superphosphate was applied at the high rate of 500 lb. per acre just after the October rains in 1919. In May, 1920, the manured camp was tested against an unmanured control camp by introducing craving cattle. By this time the new grass of the former contained over three times as much phosphorus as similar grass from the latter, and as the chart (Fig. 24) shows, the cattle in the unmanured camp retained their high "craving for bones," while those

in the manured camp rapidly lost all sign of it. The moment the latter were transferred back to the unmanured camp at the end of February, 1921, the osteophagia began to return and in a few months was as bad as ever.

This experiment is theoretical rather than practical in so far as the majority of ranching farms is concerned. With land at 10s. to 30s. per morgen (about 2 acres), as it is around Armoedsvlakte, and with a shallow soil, and low rainfall strictly limited in its seasonal incidence, phosphatic manuring does not pay; costs more than the capital value of the land. The stock-carrying capacity of Armoedsvlakte is reckoned at about "9 morgen per beast," a ten thousand morgen farm being capable of supporting rather over a thousand cattle. Seven shillings per annum spent in getting bone-meal down the throat of an animal is a highly profitable proceeding, bringing in, as shown earlier, several hundred per cent. profit as increased live-weight. The same sum scattered over 9 morgen of land with, say, superphosphate at £4 per ton, would make practically no impression on the phosphorus content of the vegetation. On the other hand, at least 80 per cent. of the bone-meal fed to an animal ultimately passes out again in the excreta, after the animal has had the use of it; and remains on the farm, manuring the veld, slowly increasing its carrying capacity for vegetation and stock, and slowly increasing the phosphorus content of the pasture.

In arid areas of cheap land, therefore, the proper thing to do is obviously to base the *primary return*, for cash outlay upon the *saleable animal*; and treat the secondary manurial return as a consolation in store for posterity. In areas where rainfall is heavier and more evenly distributed throughout the year, the soil arable and deeper, the land nearer the big industrial centres or seaports and correspondingly more valuable, direct phosphatic manuring pays. Even then, it pays primarily as an arable proposition and it is still preferable to pass the phosphorus needed by the animal *through the animal first*, using the phosphorus-rich dung for fertilising the soil. As expressed in Fig. 1, the whole chain of disaster can be broken by manuring the soil, but it is cheaper to break it by feeding bone-meal, *incidentally* effecting phosphatic manuring.

#### VIII. SOIL DEFICIENCIES.

To return now to the starting point of all the trouble; the following soil analyses are of illustrative interest when considered in the light of the results of feeding phosphorus to animals reared upon it. Technical discussion of several soils of lamsiekte and styfsiekte areas will be found in the forthcoming "Reports of the Director of Veterinary Education and Research." At this juncture only a few points of major interest need be noted.

The soil of Armoedsvlakte is shallow, varying from dolomitic outcrop to a few feet of leached soil. According to the extent of leaching it varies from a heavy dolomitic loam to a sandy soil containing very little carbonate, although still *alkaline*. The following chemical and mechanical analyses, kindly undertaken by Dr. Marchand, of the Division of Chemistry, illustrate this:—

##### *Lamsiekte Soil. Armoedsvlakte, Vryburg.*

##### *Modified Rothamsted Methods.*

Chemical Analysis.	Dolomitic Areas. Per Cent.	Leached Areas. Per Cent.
Moisture .. .. .	6.88	0.77
Loss on ignition .. ..	27.47	2.58
Insoluble matter (HCl) .. ..	31.07	90.18
Iron oxide and Alumina .. ..	1.56	6.10
Lime .. .. .	12.07	0.16
Magnesia .. .. .	21.34	0.12
Total potash .. .. .	0.11	0.42
Total phosphoric oxide .. ..	0.12	0.03
Available potash .. .. .	0.016	0.011
Available phosphoric oxide .. ..	0.001	0.0005
Nitrogen .. .. .	0.24	0.08
CO <sub>2</sub> expressed as CaCO <sub>3</sub> .. ..	45.0	0.12
<b>Mechanical Analysis.</b>		
Fine gravel .. .. .	0.12	4.82
Sand .. .. .	5.30	30.66
Fine sand .. .. .	19.19	48.82
Silt .. .. .	10.83	1.95
Fine silt .. .. .	8.52	1.91
Very fine silt .. .. .	6.00	1.61
Clay .. .. .	7.47	7.15

The next two soils are from styfsiekte farms, *Lidgetton* near Maritzburg, Natal, and *Athole* on the High Veld, in the Ermelo District. Both are leached, *acid* soils (to litmus paper), from more hilly country of higher rainfall. They are deeper and contain practically no carbonate.

*Styfsiekte Soils.*

	Lidgetton, Natal.		Athole, Ermelo.	
	Heavy Loam.	Per Cent.	Medium Grey Loam.	Per Cent.
Moisture .. ..	..	5.46	..	2.79
Loss on ignition .. ..	..	15.46	..	6.87
Insoluble matter (HCl) .. ..	..	54.24	..	72.83
Iron oxide and Alumina .. ..	..	23.54	..	16.70
Lime .. ..	..	0.08	..	0.05
Magnesia .. ..	..	0.43	..	0.05
Total potash .. ..	..	0.73	..	0.03
Total phosphoric oxide .. ..	..	0.09	..	0.06
Available potash .. ..	..	0.02	..	0.004
Available phosphoric oxide .. ..	..	0.001	..	0.001
Nitrogen .. ..	..	0.31	..	0.11
CO <sub>2</sub> expressed as CaCO <sub>3</sub> .. ..	..	Less than 0.01	..	Less than 0.01

The very low "available phosphoric oxide," .001 per cent. or less, is the feature to which it is desired to draw special attention in all three soils. So far as present investigations go, all lamsiekte and styfsiekte soils have this feature in common; and as already shown, the low available phosphorus is reflected in the later stages of growth of all grasses (irrespective of botanical species) grown upon them.

A farm, "Verona East," for which, however, a complete analysis is not available at the moment, is of special interest as being in the Vryburg District not very far from Armoedsvlakte, but as showing two large areas differing widely in "available

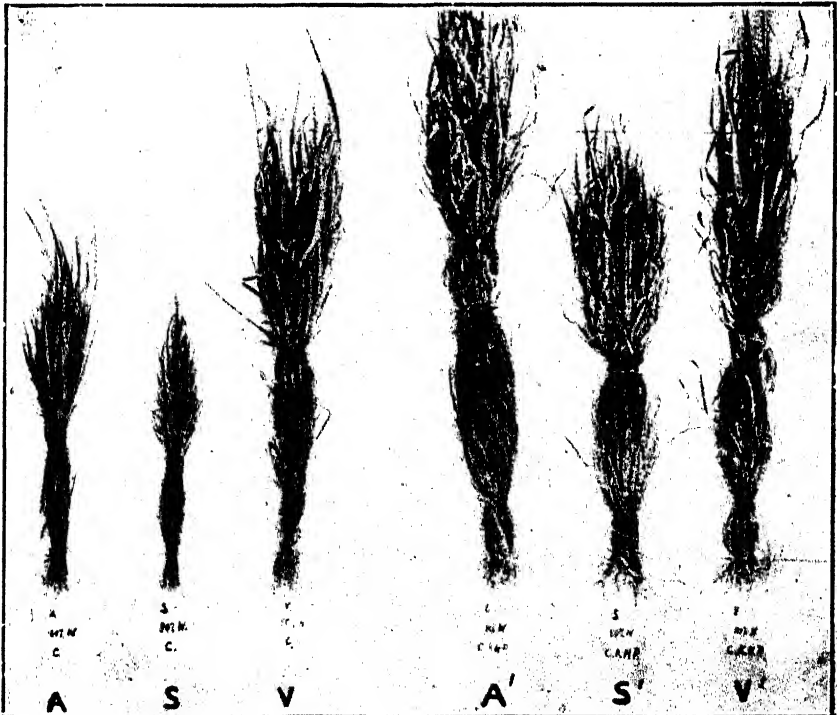


Fig. 25.—A Armoedsvlakte soil without manure; A' with full manure.  
S Shepstone " " " S' " " "  
V Verona East " " " V' " " "

phosphoric oxide." One of these areas is a grey granular stiff loam containing .009 per cent. available  $P_2O_5$ , and the other a brown granular loam containing .0027 per cent.; both exceedingly low in chalk. Osteophagia, occasionally leading to lamsiekte, occurs on the latter, but is not nearly so marked as at Armoedsvlakte. On the other area, so-called "Ganna veld," of higher phosphoric oxide, lamsiekte never occurs. If an outbreak occurs on the phosphorus-low soil it promptly fades out on transferring the cattle to the soil richer in phosphorus. The vegetation growing on these two areas of the same farm reflect the proportion of phosphorus in the soil; the same botanical species of grass showing a relatively low phosphorus-content on one and a relatively high phosphorus-content on the other.

The soil analyses shown in the foregoing tables make dreary reading in an article designed to be attractive to the farmer, and may therefore be enlivened with a few photographs representing a preliminary study of selected soils in *pot experiments*. These experiments belong to a series conducted by Dr. Van Zyl (of this laboratory) and will appear in detail in forthcoming "Reports of the Director of Veterinary Education and Research." Fig. 25, on the preceding page, offers a comparison of the lamsiekte soil of *Armoedsvlakte*, Vryburg (.001 per cent. available  $P_2O_5$ ), the styfsiekte soil of *Shepstone*, Ermelo (.0015 per cent. available  $P_2O_5$ ), and the Ganna veld soil of *Verona East* (.009 per cent. available  $P_2O_5$ ), just referred to as free from both diseases. The comparison is between cuttings of barley grown in pots on the three soils, manured and unmanured, with liberal water supply (80 per cent. W.H.C.) in all cases.

It will be seen that sheaf V is almost as abundant as sheaf V', *i.e.*, that the *Verona* soil is fertile and benefits relatively little by manuring. Sheaves A' and S' are very much superior to A and S respectively, *i.e.*, *Armoedsvlakte* and *Shepstone* soils respond very readily to manuring, by increase of crop.

That the response to manuring is primarily a response to *phosphorus* is next shown for the *Armoedsvlakte* soil, in Fig. 26, illustrating the early stages of growth in the pots:—

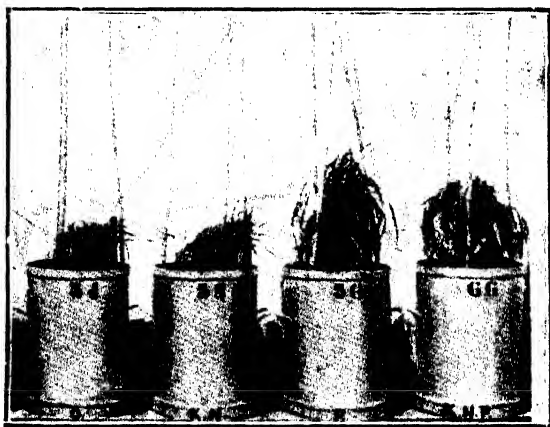


FIG. 26.

Pot 54 is the control receiving no manure. Pot 58 received potash (K) and nitrogen (N), and shows no improvement. Pot 56 received phosphorus (P) alone and responded at once, as shown by the much denser foliage. Pot 66 received nitrogen and potash as well as phosphorus, but as much the same as pot 56 receiving phosphorus alone, thus indicating that, apart from water supply, phosphorus is the main limiting factor in plant growth on the *Armoedsvlakte* soil.

In the case of *Shepstone* the soil is acid and responds to lime as well as to phosphate, as illustrated in Fig. 27.

Here it will be seen that sheaf 4 receiving lime (Ca) alone is better than sheaf 3 receiving no manure at all; and as good as sheaf 5 which receives potash and nitrogen in addition to lime. The fact that sheaf 6 receiving phosphorus and lime is as good as sheaf 7 receiving nitrogen and potash as well, indicates that the response to nitrogen (N) and potash (K) is not marked; while the great superiority of both over sheaves 3 and 4 shows quite clearly that phosphorus is again the main deficient constituent.

The influence of *water supply* is brought out by the next two photographs. Fig. 28 compares the early stage of growth of barley in pots containing the same three soils maintained under drier conditions (40 per cent. W.H.C.). Fig. 29 represents the crops cut from the same pots at an intermediate stage of growth.

It is at once apparent that when water is the "limiting factor," growth is best on the Armoedsvlakte soil and worst on the Shepstone soil, both when measured

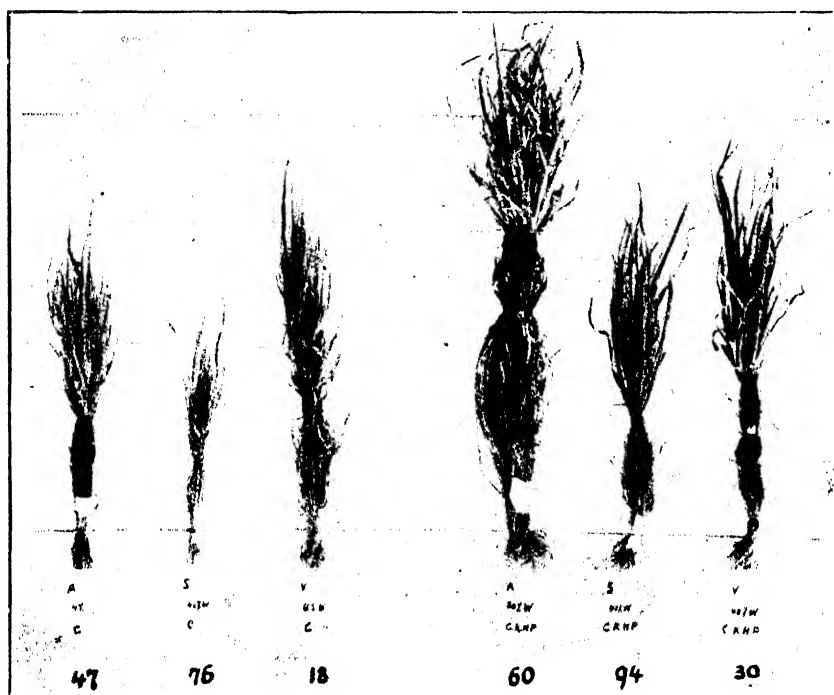


FIG. 27.

- |                                       |   |                    |
|---------------------------------------|---|--------------------|
| Fig. 27.—1 Lime alone                 | } | Low water supply.  |
| 2 Lime, Potash, Nitrogen, Phosphorus  |   |                    |
| 3 Unmanured                           |   |                    |
| 4 Lime alone                          | } | High water supply. |
| 5 Lime, Potash, Nitrogen              |   |                    |
| 6 Lime, Phosphorus                    |   |                    |
| 7. Lime, Potash, Nitrogen, Phosphorus |   |                    |

(Nos. 60, 94, and 30) and when left unmanured (Nos. 47, 76, and 18). The Verona soil (No. 18) is more sensitive to drought and shows up no better than the Armoedsvlakte soil (No. 47) under restricted water supply, although, as Fig. 25 showed, it is much superior when water supply is abundant. Comparison of sheaf 60 with sheaf 30 in Fig. 29 shows that manured Armoedsvlakte soil is superior to manured Verona soil, when the water supply is restricted; although, as Fig. 25 showed (A' and V'), much the same under abundant water supply and much inferior (A and V) when not manured.

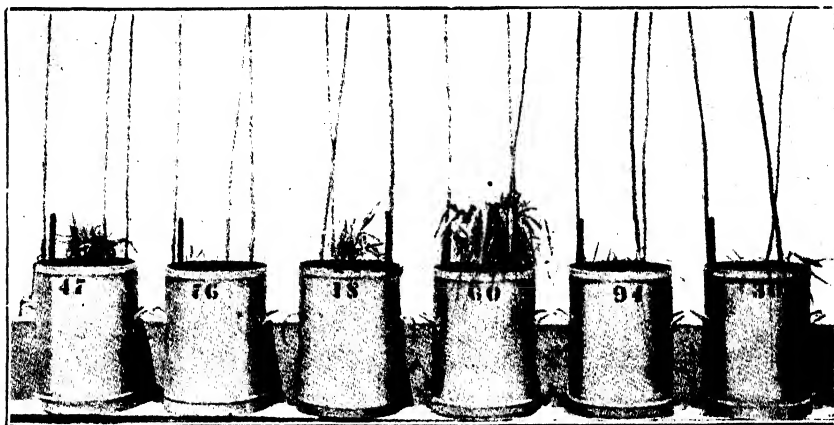


FIG. 28.—Pot 47, Armoedsvlakte, no manure; Pot 60, same, full manure.

Pot 76, Shepstone, „ „ Pot 94, „ „ „

Pot 18, Verona, „ „ Pot 30, „ „ „

All six pots *restricted* in regard to water supply. Early stage about six weeks old.

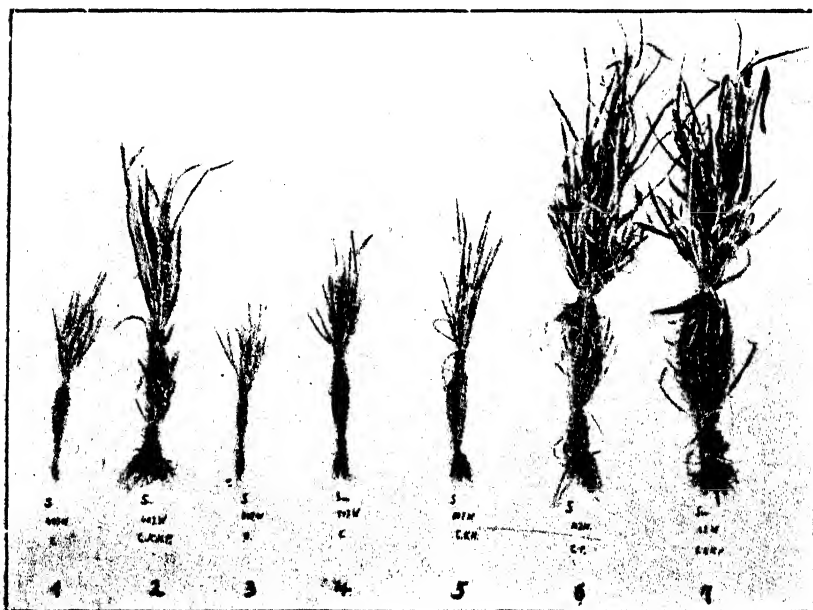


FIG. 29.—Same as Fig. 28. Barley three months old.

Crops cut from pots at intermediate green stage of growth and tied into sheaves for comparison.

Without entering into further details of the pot experiments which still have to be confirmed by *plot* (tenth acre) experiments *in situ*, it may merely be added that with the Verona soil rainfall is the main limiting factor in fertility, and that from the point of view of "plant food" it is not seriously deficient. The Armoedsvlakte soil is still subject to the limitations of rainfall, but withstands drought better wherever the depth is reasonable. With good rains, however, the second limiting factor of phosphorus deficiency enters, and although in a drought year Verona may be no better than Armoedsvlakte, the latter is far behind the former in a wet year. Unfortunately, the rainfall of the district is so unreliable and so seasonal in incidence that water supply tends to be the limiting factor in both cases, and the difference in "cattle grazed per morgen" is not so great as would be expected from the difference in fertility between the two soils. The most striking difference lies in the stunted growth of stock, and prevalence of lamsiekte, on farms of the Armoedsvlakte type, as compared with the freedom from disease and superior individual condition on farms of the Verona type.



FIG. 30.

The Shepstone soil has triple limitations; sensitiveness to drought, deficiency of phosphorus, and deficiency of lime. Fortunately, it is in an area of much higher rainfall than Armoedsvlakte, and stock raising is still possible; better for sheep than for cattle. In fact the owner had practically abandoned cattle rearing altogether in favour of sheep, owing to the prevalence of styfsiekte, until the discovery was made that bone-meal feeding would prevent that disease and permit of normal growth. The photograph above, Fig. 30, brings our story back to its starting point by showing two Shepstone animals of the same age, one fed on bone-meal and the other not, for the year preceding the taking of the photograph.

A year earlier these two animals were very similar in appearance. The one on the left now shows incipient styfsiekte and is in miserable condition. The one on the right has grown out during the year of bone-meal feeding, is in excellent condition, and quite free from the disease. Otherwise the two animals were treated in exactly the same way, running together in the same paddocks. It may be added that the one on the right had suffered from styfsiekte the year before, and was *cured* by bone-meal feeding.

The reference above, to the distinction between rearing of cattle and sheep on deficient veld, will form the subject of a later paper: suffice it to mention, that although both species of animal are susceptible to phosphorus deficiency, the feeding habits of sheep, and the "winter trekking" customs of farmers in areas such as Shepstone, render wool-growing possible even where beef production is unprofitable on the natural unsupplemented veld. It is hoped to present data upon bone-meal feeding of sheep on another occasion, since although sheep do not react to a phosphorus deficient veld in quite the same way as cattle, they do undoubtedly benefit by bone-meal feeding. They show osteophagia only in feeble fashion, hardly recognisable unless carefully observed, and therefore do not develop lamsiekte; nor, so far as is known, do they develop styfsiekte. Particularly for growth, however, a small ration of bone-meal is recommended—about half an ounce three times a week, or about two ounces a week given with an equal weight of salt in the form of a lick to which the sheep have frequent access.

## IX. REVIEW SUMMARY.

(1) This article "*Phosphorus in the Live Stock Industry*" is a companion paper to the article "*Cause and Prevention of Lamsiekte*" which appeared in the June, 1920, issue of this *Journal*. Its profusion of illustrated matter in the shape of charts and photographs is so arranged as to interest the practical agriculturist as well as the veterinarian.

(2) The first diagram offers a graphic summary of the various effects of phosphorus deficiency in cattle, and shows that the diseases lamsiekte and styfsiekte are *indirect* consequences of phosphorus deficiency in soil and pasture, although other etiological factors subsequently enter: a toxin produced from dead organic matter by a saprophytic anaerobic bacillus being the *direct* cause in the case of lamsiekte.

(3) The indirect consequences, however, are of less economic importance than the direct consequences, since the latter concern the *nutrition* of the animal itself. Low phosphorus-content is a noteworthy feature of South African soils, and over wide areas of the Union the level of phosphorus reached in the natural vegetation is below the physiological optimum requirements of cattle.

(4) Charts and photographs conclusively demonstrate that in such areas phosphorus is a *limiting factor* in the *growth* of young stock, in the *condition* of older cattle, and in the *milk yield* of cows. Any digestible phosphorus compound, given as supplement to the natural grazing, rectifies the deficiency and permits of normal development. Phosphatic manuring of the soil has the same effect, but is impracticable in ranching areas worth only 5s. to 15s. an acre. Bone-meal feeding is the practical solution for ranching conditions. Bran is useful for dairy stock or high-grade animals receiving supplementary rations in the ordinary course of events. Rock phosphate is of little value and presents difficulties in administration.

(5) The demands for phosphorus are least for mere maintenance, intermediate for growth, and highest for milk production. The bone-meal ration therefore recommended for the districts investigated varies from  $\frac{1}{2}$  lb. per head per week for adult oxen and young calves,  $\frac{3}{4}$  lb. for growing stock over 300 lb. in weight, up to 2 lb. or even more for lactating cows. This should be given in the form of daily portions (excluding Sundays), or at least tri-weekly. Bi-weekly or weekly feeding is wasteful and ineffective.

(6) On such a ration of bone-meal the rate of increase in weight during spring and summer is approximately twice that of unrationed controls. Expressed as percentage increase on initial live-weight, the gains are naturally most striking with young animals. One chart shows calves of 300 lb. live-weight that have increased in weight to about 470 lb. during the season on the natural grazing, and to about 640 lb. when supplied with bone-meal. The immediate effect upon growth is clearly brought out by photographs. Accompanying the superiority in weight, comes earlier maturity and superior quality of beef.

During the rainless winter the grazing is naturally poor and no headway is made by the stock. The phosphorus-fed cattle, however, maintain the advantage gained during spring and summer; and in some cases improve upon it in spite of the adverse conditions to which all stock are then subjected. Phosphorus feeding is shown to pay several hundred per cent. upon the outlay for bone-meal.

(7) The interesting phenomenon of "*Osteophagia*," a specific form of "*Pica*," is well illustrated, and its value as a symptom of phosphorus deficiency discussed.

(8) The methods adopted for routine feeding of bone-meal under practical ranching conditions are illustrated by photographs.

(9) An interesting experiment establishing the relationship between "*phosphorus and food consumption*" is discussed, and it is quite clearly shown that although animals receiving a bone-meal ration do eat more food in putting on additional weight, they also give a much better return "*per unit of food consumed*." When the phosphorus deficient controls were coaxed to eat more food than required for mere maintenance, they simply "*combusted*" the excess for no useful purpose. A *functional* as well as a *structural* role is predicated for phosphorus in cellular metabolism, and an analogy drawn with the "*vitamins*." Cattle artificially "*stunted*" in growth for about a year by dietary deficiency of phosphorus showed a growth rate almost above the normal on supplying the missing factor.

(10) Seasonal variation of phosphorus-content in the natural grazing is then discussed, data on chemical composition of the grasses being correlated with data derived by determining the amount of phosphorus required to prevent osteophagia in the cattle. As would be expected, the deficiency is least acute in the young grass and increases as the grass matures, the actual percentage phosphoric oxide of the dry winter vegetation being about .08 per cent. Broadly speaking, however, the

grazing is below normal requirements of mixed stock all the year round. The ratio "phosphorus content" to "energy value" serves as a rough guide in assessing deficiency by analytical methods. A few interesting veld photographs of the area studied are shown.

(11) A few analyses are presented, comparing soils from lamsiekte and styfsiekte farms with similar soils free from these diseases. Shortage of phosphorus, generally down to .001 of "available phosphoric oxide," is the characteristic feature of the "deficient soils." Photographs of "pot experiments" enliven the analytical data, the crops obtained indicating phosphorus deficiency and low rainfall as the two main factors limiting the stock-carrying capacity of the Bechuanaland dolomitic district concerned; phosphorus alone, or phosphorus and lime, being the limiting factors in the well-watered but extensively leached soils of the Natal District and Ermelo High Veld.

#### CONCLUSION.

In concluding this article a broad recapitulation for the practical farmer is worthy of italics:—

*In all areas where the soil and pasture are known to be deficient in phosphorus, it is profitable to feed bone-meal to practically all stock for the sake of improving condition and facilitating rapid growth. For cattle it is particularly advisable since two important diseases, lamsiekte and styfsiekte, can be prevented by liberal bone-meal feeding. When insurance against disease, increased beef production, increased milk yield, and more rapid growth of young cattle are all taken into consideration, it will be found that any expenditure on bone-meal is repaid many times over.*

*Acknowledgments.*—It is a pleasure to render acknowledgment to Mr. D. T. Mitchell for supervision of the programme at Armoedsvlakte during 1920-21; to Dr. F. Veglia for like service in 1921-22; to Mr. Fourie in 1923; to Mr. Rodgers and Mr. Du Plessis for execution of detail at Armoedsvlakte, and to Mr. Marais for like work at Shepstone; to Mr. Richards, owner of Shepstone; and to Mr. T. Meyer for assistance with earlier experimental work and with charts and photographs.

### USE OF DISINFECTANTS ON THE DAIRY FARM.

Deterioration in the quality of milk and cream has in several instances been traced to the use of disinfectants on the dairy farm through its addition to water used in the cleansing of milking machines, separator parts, buckets, cans, cows' teats and udders, and to the water used by milkers for cleansing their hands. The application of ointment to the sore teats of milch cows caused the trouble in a few instances.

For the purpose of cleansing milking machines, separator parts, and all dairy utensils, a small quantity of washing soda added to warm cleansing water will remove all grease and particles of dirt. After this is done all parts of plant and utensils that come in contact with the milk and cream must be sterilised by the use of boiling water or live steam.

The teats and udders of the cows should be washed in warm water and dried with a clean cloth. When a healing ointment has been applied to the teats, all trace should be removed with warm water before milking and the teats smeared with vaseline and dried with a clean cloth. On completion of the milking, wash and dry the teats and apply the healing ointment when necessary.

The milkers' hands should be cleansed thoroughly with warm water and soap and then dried. The wash water should be changed as required, so as to prevent its being contaminated.—C. McGRATH, Supervisor of Dairying.

#### THE JOURNAL APPRECIATED.

*Thus a Goombungee farmer (28/11/27): "Just a line to let you know how we appreciate the 'Queensland Agricultural Journal.' We enjoy reading it very much. I am enclosing a subscription for Mr. ——— as a Christmas present for him. I am sure he will like the Journal.'"*

## RAINFALL IN THE AGRICULTURAL DISTRICTS.

TABLE SHOWING THE AVERAGE RAINFALL FOR THE MONTH OF JULY, 1928, IN THE AGRICULTURAL DISTRICTS, TOGETHER WITH TOTAL RAINFALL DURING JULY, 1928 AND 1927, FOR COMPARISON.

Divisions and Stations.	AVERAGE RAINFALL.		TOTAL RAINFALL.		Divisions and Stations.	AVERAGE RAINFALL.		TOTAL RAINFALL.	
	July.	No. of Years' Records.	July, 1928.	July, 1927.		July.	No. of Years' Records.	July, 1928.	July, 1927.
<i>North Coast.</i>					<i>South Coast—continued:</i>				
Atherton ...	In. 0.90	26	In. 2.23	In. 2.16	Nambour ...	In. 2.92	31	In. 1.02	In. 0.30
Cairns ...	1.57	45	1.50	2.02	Nanango ...	1.74	45	0.84	0.55
Cardwell ...	1.39	55	0.64	2.04	Rockhampton ...	1.46	40	0.30	2.27
Cooktown ...	1.00	51	0.25	1.20	Woodford ...	2.48	40	1.38	0.49
Herberton ...	0.72	40	2.58	1.85					
Ingham ...	1.52	35	0.73	3.10					
Innisfail ...	4.67	46	5.15	6.76	<i>Darling Downs.</i>				
Mossman ...	1.42	14	0.86	1.48	Dalby ...	1.77	57	1.18	0.41
Townsville ...	0.56	56	0.02	5.41	Emu Vale ...	1.58	31	2.07	0.84
					Jimbour ...	1.62	39	1.32	0.27
<i>Central Coast.</i>					Miles ...	1.69	42	2.15	0.07
Ayr ...	0.65	40	...	4.13	Stanthorpe ...	2.07	54	2.54	0.10
Bowen ...	0.93	56	0.08	2.49	Toowoomba ...	2.08	55	1.61	0.52
Charters Towers ...	0.62	43	0.09	2.63	Warwick ...	1.84	62	1.84	0.46
Mackay ...	1.67	56	0.05	3.29					
Proserpine ...	1.30	24	0.55	3.61	<i>Maranoa.</i>				
St. Lawrence ...	1.28	56	0.09	3.38	Roma ...	1.19	53	0.82	0.16
<i>South Coast.</i>					<i>State Farms, &amp;c.</i>				
Biggenden ...	1.42	28	0.64	0.70	Bungewonggorai ...	1.73	12	0.50	0.10
Bundaberg ...	1.89	44	0.96	1.06	Gatton College ...	1.45	27	0.79	0.14
Brisbane ...	2.26	77	0.72	0.52	Gindie ...	1.04	27	0.23	0.11
Caboolture ...	2.27	40	1.04	0.52	Hermitage ...	1.81	20	1.65	0.76
Childers ...	1.77	32	0.67	1.43	Kairi ...	1.25	12	1.21	1.54
Crohamhurst ...	2.97	35	1.46	0.47	Sugar Experiment Station, Mackay	1.50	29	...	3.07
Eak ...	2.02	40	1.50	0.80	Warren ...	1.27	12	...	1.50
Gayndah ...	1.49	56	0.67	0.99					
Gympie ...	2.21	57	1.39	0.46					
Kilkivan ...	1.79	48	0.86	0.63					
Maryborough ...	1.94	55	1.20	0.81					

NOTE.—The averages have been compiled from official data during the periods indicated; but the totals for July this year, and for the same period of 1927, having been compiled from telegraphic reports, are subject to revision.

GEORGE G. BOND,

Divisional Meteorologist.

## QUEENSLAND RAIN-FOREST TREES.

By W. D. FRANCIS, Assistant Government Botanist.

The Weeping Myrtle, which is illustrated by the accompanying photographs, is commonly seen overhanging freshwater streams in the lighter class of "scrub" or rain forest. The species is known botanically as *Eugenia Ventenatii*. The trees attain a height of about 80 ft. and a stem diameter of about 2 ft. 6 in. On large trees the bark is gray or dark-gray and prominently furrowed or fissured. The species is recorded from as far south as the Hastings River in New South Wales (C. Moore) and from Rockingham in the north of Queensland (Bentham).



Photo.: W. D. Francis.

PLATE 79.—WEEPING MYRTLE (*Eugenia Ventenatii*), A LARGE DOUBLE-STEMMED SPECIMEN ON THE BANKS OF ITHACA CREEK, NEAR BRISBANE.



Photo.: Dept. Agriculture and Stock.]

PLATE 80.—WEEPING MYRTLE, *Eugenia Ventenatii*.

- A—Flowering twig;
- B—Twig bearing dried fruits;
- C—Leaf showing underside.

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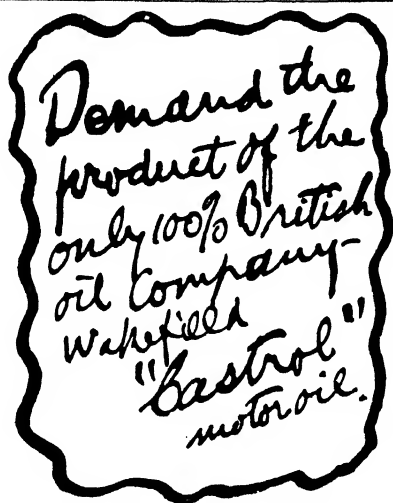
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## THE VICTORIAN MEAT EMBARGO.

### RESTRICTIONS CONTRARY TO THE SPIRIT OF FEDERATION.

The Premier (Mr. W. McCormack) has given the following information to the Press:—

The Victorian Public Health Department, under the Meat Supervision Regulations recently issued, requires that any carcass or meat introduced from any place outside Victoria must be conveyed to the Government Cool Stores, Victoria Dock, or some other suitable place, for examination and branding. It is also provided under these regulations that every person who sells any meat which has been chilled or frozen shall attach a label to the meat or package stating if such meat is chilled or frozen, as the case may be, and where it is imported the word "imported" must be inserted on the label. This means, in effect, that to every small cut of meat, weighing possibly not more than 1 lb., there shall be attached a label setting out the foregoing particulars.

It is obvious that the regulations have been very carefully framed and are designed to exclude the entry of meat into Victoria for sale from other States, especially in regard to the impracticability of fulfilling the requirements of the Victorian Regulations applying special brands to retail sales of chilled meats.

#### A Constitutional Point.

Exception is also taken by the Premier to the term "imported," as applying to goods produced within Australia, and he referred to the special definition given under the Victorian Regulations which means that the word applies to any place outside Victoria and not outside Australia. This procedure is significant of the desire of the Victorian authorities to take action which is tantamount to the restriction of trade between the States, and is quite a modern conception of the use of the word "imported" as applying to goods or produce produced in one State of the Commonwealth and tendered for sale in another State.

#### An Untenable Argument.

Statements made in the Victorian press that stale meat has been foisted upon the public to the detriment of the health of the community are difficult to understand. The chilled meat supplied by Queensland is despatched from meatworks which are conversant with the preparation of meat for export, and where slaughtering operations and the examination of the carcass and viscera are under the control and supervision of skilled veterinary surgeons.

#### Chilled Meat a Wholesome Food.

It is generally agreed that chilled meat is essentially a wholesome food, and it is estimated that practically all the beef supplied to consumers from the metropolitan abattoirs in Sydney is chilled before reaching those consumers, and that in the case of beef supplied to consumers in Melbourne about 60 per cent. of such meat is chilled at some stage before delivery. Consequently it appears anomalous that exception should be taken to the supply to the Victorian public of chilled meat of Queensland origin.

#### A Restriction of Interstate Trade.

For the benefit of consumers who may be unaware of the fact, the Premier pointed out that practically one-half of the cattle within the Commonwealth are in this State, and the markets of Victoria and other States must provide a natural outlet for some of the beef and meat products raised in Queensland. Conversely, the people of this State consume and utilise a large proportion of raw and manufactured products from Victoria, and there has been no suggestion that harassing restrictions on the importation of these products should be insisted upon by the authorities in this State.

In practice, it is impossible to conform with the Victorian requirements in respect of the introduction of meat into that State, and while it is recognised that it is a matter for the State Government concerned to take such action as would fully safeguard the public health of the community, it is considered that in this particular case the interests of consumers in the Southern State would be fully safeguarded by the adoption of more practical methods than are at present in force.

## METHYLENE BLUE REDUCTION TEST.

### ITS VALUE IN MILK GRADING.

C. McGRATH, Supervisor of Dairying.

*These notes are reprinted from the Journal for April, 1927, in response to repeated requests for information on the subject.*

The methylene blue reduction test, as a quick method for determining approximately the number of bacteria present in a sample of milk, is recommended to graders at cheese factories and milk-receiving stations.

The process is not as accurate as the plate culture or the most recent direct microscopic count methods.

The latter tests, however, are more complicated and expensive, and call for special training and more skill than in carrying out the methylene blue reduction test.

A comparison of the results of grading milk by the direct microscopic count and the methylene blue reduction determination has proved that the latter test can be used with advantage where milk is received for human consumption or manufacturing purposes.

The methylene blue reduction test is of special value for the grading of milk received at cheese factories, as a fermentation test can be made on the same sample of milk, after the colour reduction time has been recorded.

It is not suggested that this test would take the place of the usual inspection and grading of the milk which must always be carried out by a qualified milk-grader.

No technical description of milk and no test at present known can replace the practical knowledge obtained by experience in the grading of milk and its products.

Descriptions of odours and flavours of milk and its products, in terms definite enough to guide an inexperienced grader, have been found to be impossible.

The methylene blue reduction test can be made when the grader decides that it will aid him in determining the quality of milk.

The test, however, should be applied to each milk supply a few times each month, and by averaging the reduction time results the work of the grader becomes of greater value.

When the test has been in operation for some time, the average quality of each patron's milk can be more definitely determined.

Attention can be given to improve the quality of the milk below first grade.

In classing the milk delivered at a cheese factory, the grader will readily discern the night's milk from the morning supply.

A pleasant, clean, partially-ripened flavour of the milk held overnight indicates that the milk has been produced under sanitary conditions, and the desirable lactic acid micro-organisms predominate.

The clean, pleasant, fresh smell and flavour of the morning's milk is indicative of the conditions under which the milk is produced, handled, and delivered at the factory.

To produce a first-grade milk having a low acidity and bacterial count and free from excess sediment requires care and attention on the part of the producer and is a more expensive operation than the production of milk of a lower grade. High-grade milk and its products increase consumption and raise the price of such products with benefit to all engaged in the industry.

Producers of first-quality dairy products should be paid a substantial premium. Low-grade dairy products decrease consumption and lower the price for high-grade products.

### The Test.

It has been determined that when a definite amount of methylene blue has been added to a sample of milk and a temperature of 98 deg. Fah. is maintained, that decoloration occurs at a rate determinable by the number of bacteria present.

Milk which contains several million bacteria per cubic centimetre will be decoloured in a few minutes, while milk which contains a few thousand bacteria per cubic centimetre will retain the blue colour for several hours.

The decoloration is dependent upon the amount and rapidity of acid produced by the activity of the bacteria in the milk samples.

To carry out the methylene blue reduction test only a small amount of apparatus is required, and consists of—

Glass test tubes, 6 x  $\frac{1}{4}$  in.;

Rack for holding same;

Water bath to maintain temperature of samples;

20 c.c. milk pipette.

Stock solution of methylene blue is made by dissolving 1.1 grams dry methylene blue dye in 500 c.c. of distilled water.

The dilute solution for use is made, as required, by adding 39 c.c. of distilled water to 1 c.c. of methylene blue stock solution. This dilution will keep three days, and gives one part of dry crystalline blue in 200,000 parts of the milk sample tested.

*Procedure.*—Mix the milk thoroughly before drawing off the sample.

Pipette 20 c.c. of the milk and deliver into a sterile test tube; add 2 c.c. of dilute methylene blue. Mix thoroughly, and close with a cotton plug. Place the test tubes in a bath and keep at a temperature of 98 to 100 deg. Fah. Observe the change in the colour of the milk at intervals.

By comparing the test milk samples with a quantity of normal milk the time of disappearance of the blue colouration can be fixed.

The grade of the milk is determined by the rapidity with which the blue colour disappears.

The following times record the standards according to Hunziker:—

Time decoloration.	Quality milk.
2 hours .. .. .	Poor
2 to 5½ hours .. .. .	Fair
Over 5½ hours .. .. .	Good

The methylene blue test and its relation to bacterial content of tested milk is shown in the following table:—

Time decoloration.	Classification.	App. number of bacteria per c.c.
Less than 20 minutes ..	Poor ..	20 millions
20 minutes to 2 hours ..	Medium ..	4 to 20 millions
2 hours to 6 hours ..	Fair ..	$\frac{1}{2}$ to 4 millions
6 hours or over ..	Good ..	Less than $\frac{1}{2}$ million

Sterilise test tube and pipette by boiling for 20 minutes before use.

Close test tubes with plug of cotton when in rack awaiting use, and insert cotton plug as soon as sample of milk is delivered into same. Keep closed during the period of the test.

Rinse the pipette with boiled water after sampling each supply.

The stock solution will keep for six months.

The dilute solution to be added to the samples of milk will keep three days.

The methylene blue reduction test will assist the grader to divide the milk supply into several grades. A low bacterial count is indicative of sanitary production and handling of the milk.

The age and local climatic conditions, together with the milk grader's practical experience, enable him to assess the value of the test which can be used in cheese factories and milk-receiving stations with advantage.

#### PLEASED WITH THE JOURNAL.

*A Mulgeldie farmer writes (27/12/27): "Kind'y renew my subscription to the 'Queensland Agricultural Journal.' May I say that I think your Journal is one of the best published for the man on the land. . . . Wishing your Department and Journal continued success."*

## A TON LITTER OF DUROC-JERSEY PIGS.

It will interest readers generally to learn that the "Ton" litter of Duroc-Jersey pigs which Mr. Percy Campbell, of Lamington, had on exhibition at Brisbane Show completed the test for a "short" ton (2,000 lb.) one week before they were six months old. Ten pigs were saved of twelve farrowed, and it was these ten pigs that averaged 200 lb. each when one week short of six months old. They were fed on farm foods in plenty, and were given good care and attention, though weather conditions for the first four months of the test were somewhat unfavourable.

This record does not exceed the ton litter of Gloucester Old Spot pigs which were bred and fed at Orhost, Victoria, by Messrs. Russell and Johnstone, but indicates that considerable progress has been and is being made in the development of early-maturing marketable pigs.

It is, of course, understood that the markets of to-day do not call for these heavyweight pigs, but it is of considerable interest to know that it is possible under Australian conditions to develop pigs to the weight of 200 lb. alive at six months old, for after all it represents a good deal more than an average daily increase in weight of 1 lb. per day on farm-grown foods, and under conditions which are possible on any farm where the business is carried on along reasonable lines and where good animal husbandry is practised.

The pigs made a fine picture when they were out for exercise. They were exceptionally well developed, and represented the most up-to-date type of Duroc-Jersey pig we have yet seen at an Australian show. "Of course, it means a lot of work," said Mr. Campbell, "but it is surely worth while to demonstrate what can be done if one has the type of pig one fancies and a type that can be developed to maturity as bacon pigs at less than six months of age." It is noteworthy that the Duroc-Jersey and Gloucester Old Spot breeds are the first in Australia to put up such excellent weight records.—E. J. SHELTON, Instructor in Pig Raising.

## PIG PRODUCTS AT THE SHOW.

Good progress has been made in recent years as a result of an active and progressive campaign by the Department of Agriculture and Stock, and considerable attention has been focused upon the business of pig farming, as an adjunct both to dairying and to other branches of agriculture. Production is increasing, quality is certainly improving, and the returns to the producer are much more lucrative now than in days gone by. During recent months, however, pig prices have been lower than usual, and farmers have had something of a set-back which, though temporary, is nevertheless disappointing. In July and August, pig prices improved considerably, and prospects appear bright for further increases, particularly in view of the higher values ruling in the Southern States.

Lower prices to the farmer have, however, not been without some compensation, if it can be so regarded, for the lower range of cost to the consumer for hams, bacon, and other pig products has resulted in an appreciable increase in consumption.

Featuring this particular aspect of the business, the array of pork products at this year's Show superseded any previous attempt at their display, and both in the Meat Industry Hall and in the court of the Department of Agriculture and Stock attractive and educational exhibits were staged.

A prominent feature of the Departmental display was the comparison between several grades of bacon, the objective being to focus the attention of farmers upon the importance of producing nothing but the very best quality commodity it is possible to market. Public taste is changing, the popular heavyweight fat bacon of years ago has gone for ever, and in its place the meaty pork chop has come to stay. The demand nowadays is for prime quality fleshy bacon only. Pithy slogans announced that a meal without meat is not complete—that meat is a tissue builder—that meat makes muscle—that children need meat for protein, energy, minerals, and vitamins—that meat sundries are sources of vitamins—that lean meat is rich in iron—that meat fat is palatable and digestible; while everyone was urged to make meat the centre of the balanced diet.

The array of pork products in the Departmental court, as well as in the trade displays, were worth going a long way to see.—E. J. SHELTON, Instructor in Pig Raising.

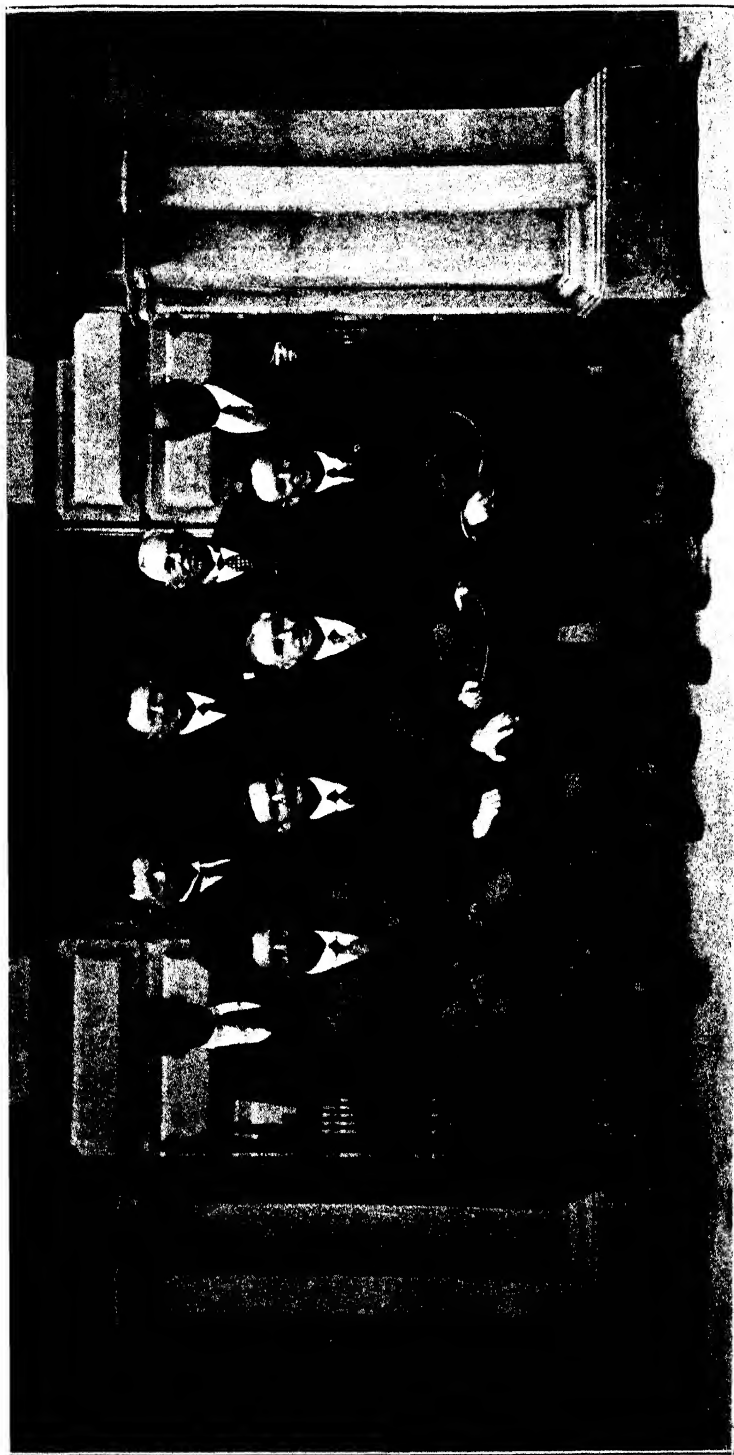


PLATE 81.—QUEENSLAND PIG INDUSTRY COMMITTEE.

*Front Row* (reading from left to right):—Messrs. A. B. Anderson (J. C. Hutton's Pty., Ltd.), E. J. Shelton (Instructor in Pig Raising, Department of Agriculture and Stock and Chairman), T. L. Jones (Foggitt Jones Pty., Ltd.), J. A. Heading (Queensland Co-operative Bacon Association).

*Back Row* (left to right):—J. Winders (Stenographer), H. O'Boyle (Commonwealth Department's Representative), A. J. Mackenzie (Instructor in Animal Husbandry, Gatton College), John Hardcastle (Dugandan), R. G. Watson (Brisbane).

*Absent from Group*:—E. E. Forth of J. C. Hutton's Pty., Ltd. and Mr. H. M. Hart, Darling Downs Co-operative Bacon Co., Ltd.

## JUDGING UTILITY POULTRY.

By P. RUMBALL, Poultry Expert.

In the judging of utility poultry, the judge must be acquainted with two standards—one known as the Poultry Club standard and the other the Utility standard. The former indicates the type, colour, and general appearance of the breed, while the latter embodies features indicative of high production.

During the present year many juvenile poultry clubs have been formed. The Department of Agriculture and Stock is co-operating with the Department of Public Instruction in this work, and in order to obviate the necessity for club members to make a study of both standards and arrive at a well-balanced decision as to what is required, have drawn up a utility score card for the White Leghorn, as this breed is being most extensively used by club members.

### UTILITY SCORE CARD FOR JUVENILE POULTRY CLUBS.

Breed: White Leghorns.

<i>Head.</i> —Skull, fine, full, and rounded at back; beak, medium, length, stout and slightly curved, point well clear of front of comb; colour yellow (with continued production colour fades) .. .. .	7
<i>Eyes.</i> —Bright reddish gray in colour, full, prominent and expressive ..	10
<i>Comb and Wattles.</i> —Bright red in colour, medium size, fine in texture. Comb: Male, perfectly erect, rising from a firm base, moderately thin, extending well beyond the back of the head, following, without touching, the line of the neck, deeply and evenly serrated, the spikes broad at base, free from thumb marks and side sprigs; Female, same as male, except that the comb falls gracefully to either side .. .. .	5
<i>Face.</i> —Bright red, lean, smooth (not sunken), free from feathering and whiteness .. .. .	3
<i>Lobes.</i> —Ear lobes well developed, equally matched, smooth and open; colour, white or cream, white preferred .. .. .	3
<i>Type.</i> — <i>Male:</i> Wedge-shaped, wide at shoulders, narrowing as little as possible to the tail; breast full and rounded; back long, broad and sloping to the tail; neck medium length, well-furnished with hackle feathers; tail full with flowing sickle feathers and carried at an angle of 45 degrees from the back; saddle hackle profuse; fluff moderate; carriage alert, well balanced and upright; wings tightly carried and well clipped up.	
<i>Female.</i> —The type of the female is similar to that of the male, with the exception that the tail is not carried at such a high angle. In addition to natural sexual features, such as comb, tail, &c., the general body carriage is not as upright .. .. .	20
<i>Skin and Abdomen.</i> —Texture of skin to be of the thinnest and finest quality, and pliable; abdomen to be elastic, avoiding sagging in, or fullness indicating excess of fat .. .. .	5
<i>Legs and Feet.</i> —Strong, medium length, wide apart, yellow in colour (bleaching with production), free from feathering or fluff; toes, strong and well spread .. .. .	3
<i>Plumage and Condition.</i> —Feathers soft and silky, pure white in colour, close but not hard, as in Game; cleanliness of feathers and legs and general health essential .. .. .	14
<i>Size.</i> —Male (6 months old), 5 lb., female, 3½ lb. Birds weighing ½ to 1 lb. above these weights to score maximum points, those in excess or under weight to be out .. .. .	5
<i>Conformation (indicating capacity).—</i>	
(a) Length, as taken from the base of the neck to the base of the tail.	
(b) Depth to be determined by the vertical space between the back and the breast bone and between the end of the breast bone and the pelvic bones.	
(c) Width as measured across the saddle and immediately behind the wings, and as indicated by the distance apart of the legs ..	20
<i>Freedom from Coarseness.—</i>	
(a) Shanks strong, not too coarse or too fine in bone.	
(b) Pelvic bones strong at base, fine and straight.	
(c) Tissue—pelvic bones to be free as possible from gristly covering ..	5
<b>TOTAL .. .. .</b>	<b>100</b>

## SUGAR LEVIES.

Regulations under "*The Primary Producers' Organisation and Marketing Act of 1926*" have been approved, providing for levies on suppliers of cane to sugar-mills at the following rates for the season 1928 (the figures for 1927 are given for comparison purposes):—

Name of Mill.	General Levy by Queensland Cane Growers' Council.	Defence Fund Levy by Queensland Cane Growers' Council.	Levy by District Executive.	Special Levy by District Executive.	Levy by Sugar Mill Suppliers' Committee.	Total Levies for 1928.	Total Levies for 1927 given for comparison.
	d.	d.	d.	d.	d.	d.	d.
Mossman Central .. .. .	$\frac{3}{4}$	1	$\frac{1}{8}$	4	..	$5\frac{7}{8}$	$6\frac{1}{4}$
Hambledon .. .. .	$\frac{3}{4}$	1	$\frac{1}{8}$	$\frac{1}{4}$	..	$2\frac{3}{4}$	$2\frac{1}{2}$
Babinda Central .. .. .	$\frac{3}{4}$	1	$\frac{1}{8}$	..	..	$1\frac{7}{8}$	$2\frac{1}{4}$
Mulgrave Central .. .. .	$\frac{3}{4}$	1	$\frac{1}{8}$	..	..	$1\frac{7}{8}$	$2\frac{1}{4}$
South Johnstone Central .. .. .	$\frac{3}{4}$	1	$1\frac{1}{2}$	..	1	$4\frac{1}{4}$	$5\frac{1}{4}$
Goondi .. .. .	$\frac{3}{4}$	1	$1\frac{1}{2}$	..	..	3 $\frac{1}{2}$	$5\frac{1}{2}$
Mourilyan .. .. .	$\frac{3}{4}$	1	$1\frac{1}{2}$	..	$\frac{1}{2}$	$3\frac{3}{4}$	$5\frac{1}{4}$
Tully River Central .. .. .	$\frac{3}{4}$	1	$2\frac{1}{2}$	..	..	$4\frac{1}{4}$	$5\frac{1}{2}$
Macnade .. .. .	$\frac{3}{4}$	1	$\frac{1}{2}$	..	..	$2\frac{1}{4}$	3
Victoria .. .. .	$\frac{3}{4}$	1	$\frac{1}{2}$	..	..	$2\frac{1}{4}$	3
Kalamia .. .. .	$\frac{3}{4}$	1	1	..	..	$2\frac{3}{4}$	$3\frac{1}{2}$
Pioneer .. .. .	$\frac{3}{4}$	1	1	..	..	$2\frac{3}{4}$	$3\frac{1}{2}$
Inkerman .. .. .	$\frac{3}{4}$	1	$\frac{1}{2}$	..	..	$2\frac{1}{4}$	$2\frac{1}{2}$
Invicta .. .. .	$\frac{3}{4}$	1	1	..	..	$2\frac{3}{4}$	4
Proserpine Central .. .. .	$\frac{3}{4}$	1	2	..	..	$3\frac{1}{4}$	$4\frac{1}{2}$
Cattle Creek Central .. .. .	$\frac{3}{4}$	1	1	..	..	$2\frac{3}{4}$	3
Plane Creek Central .. .. .	$\frac{3}{4}$	1	1	..	..	$2\frac{3}{4}$	3
Marian Central .. .. .	$\frac{3}{4}$	1	1	..	..	$2\frac{3}{4}$	3
North Eton Central .. .. .	$\frac{3}{4}$	1	1	..	..	$2\frac{3}{4}$	3
Pleystowe .. .. .	$\frac{3}{4}$	1	1	..	1	$3\frac{1}{4}$	4
Racecourse .. .. .	$\frac{3}{4}$	1	1	..	..	$2\frac{3}{4}$	3
Farleigh .. .. .	$\frac{3}{4}$	1	1	..	..	$2\frac{3}{4}$	3
Qunaba .. .. .	$\frac{3}{4}$	1	$\frac{1}{4}$	..	..	2	$2\frac{1}{4}$
Bingera .. .. .	$\frac{3}{4}$	1	$\frac{1}{4}$	$\frac{3}{4}$	..	$2\frac{3}{4}$	3
Fairymead .. .. .	$\frac{3}{4}$	1	$\frac{1}{4}$	..	..	$2\frac{3}{4}$	$3\frac{1}{4}$
Gin Gin Central .. .. .	$\frac{3}{4}$	1	$\frac{1}{4}$	$\frac{3}{4}$	..	$2\frac{3}{4}$	$2\frac{1}{2}$
Millaquin .. .. .	$\frac{3}{4}$	1	$\frac{1}{4}$	..	$\frac{1}{2}$	$2\frac{1}{2}$	$2\frac{1}{2}$
Isis Central .. .. .	$\frac{3}{4}$	1	$\frac{1}{4}$	$\frac{1}{4}$	..	$2\frac{1}{4}$	$3\frac{1}{2}$
Childers .. .. .	$\frac{3}{4}$	1	$\frac{1}{4}$	..	..	2	$2\frac{1}{4}$
Maryborough .. .. .	$\frac{3}{4}$	1	$\frac{1}{4}$	..	..	$2\frac{1}{4}$	$2\frac{3}{4}$
Mount Bauple Central .. .. .	$\frac{3}{4}$	1	$\frac{1}{4}$	..	..	$2\frac{1}{4}$	$2\frac{3}{4}$
Moreton Central .. .. .	$\frac{3}{4}$	1	$1\frac{1}{2}$	..	..	$3\frac{1}{2}$	$4\frac{3}{4}$
Rocky Point .. .. .	$\frac{3}{4}$	1	1	..	..	$2\frac{3}{4}$	3

\* Booyal.

† Pialba.

No poll will be taken in respect of the General Levy of  $\frac{3}{4}$ d. per ton (1st column) for the Queensland Cane Growers' Council; but before the other levies are made, growers are given the opportunity of petitioning, before 1st October, 1928, for a poll to decide whether or not any particular levy shall be made. In the case of the levy of 1d. for a Defence Fund, the petition must be signed by at least 100 canegrowers.

In the case of any of the other three levies, the petition must be signed by at least 100 or 50 per cent. (which ever shall be the less) of the cane suppliers to any particular mill.

The Defence Fund Levy (2nd column) will be utilised for the purpose of creating a Defence Fund for the Queensland Cane Growers' Council. The levies by District Executives (3rd column) will be utilised for administration purposes of the respective District Cane Growers' Executives and of the Mill Suppliers' Committees in the respective districts.

The levies mentioned in the 4th column for Hambledon, Mossman, Bingera, and Isis will be used for administration purposes of the respective Mill Suppliers' Committees. The Gin Gin levy will be utilised for administration purposes of the Cane Suppliers' Association and the Sugar Mill Suppliers' Committee.

In the 5th column the Mourilyan, South Johnstone, and Millaquin levies will be used for administration purposes of the respective Mill Suppliers' Committees. At Pleystowe the levy will be used in defraying the expenses of a check weighman at the Mill. At Moreton the levy will be utilised in defraying the expenses of a Farmers' Representative at the Mill.

Full particulars of these Regulations appear in the *Government Gazette* of the 30th August, 1928, or may be obtained on application to the Managers of the various sugar-mills in Queensland or to the undersigned—

E. GRAHAM, Under Secretary,  
Department of Agriculture and Stock,  
Brisbane.

30th August, 1928.

### **QUEENSLAND NUTS.**

**Best, say experts. Hardy—Exportable—  
Profitable. Plant among bananas.**

***For best seed and plants—***

**S. M. GREER, Dungay, Murwillumbah,  
Via Tweed, N.S.W.**

## CO-OPERATIVE CARTAGE OF CREAM.

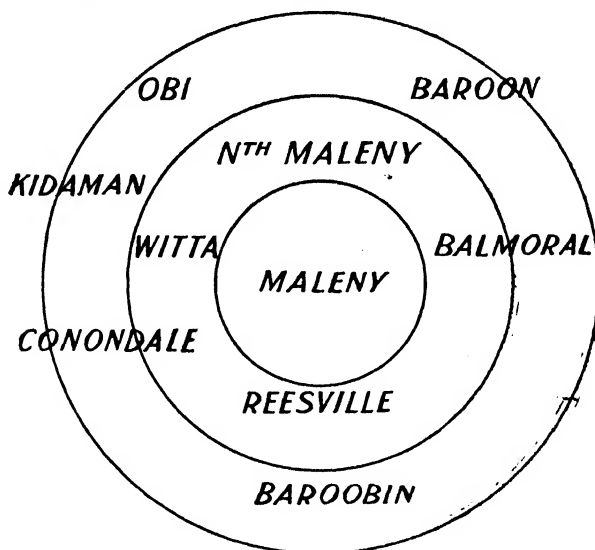
By S. A. CLAYTON, Inspector of Dairies.

The co-operative cartage of cream is a link in the chain of farmer co-operation, and gives effect to a slogan for the dairying industry—"Co-operation from the cow to the consumer."

The co-operative butter factory is the manufacturing unit of the dairying industry, and should be the pivotal point of farmer activity in the district it serves. One further step to that end would be co-operative cartage of cream.

Take, for instance, a factory which is financed by its suppliers taking up an equal number of shares, the man living alongside the factory taking up no more than the most distant supplier (say, 15 miles). The dairy farmer living close to the factory gets more for his "supplier-shares" by having some value added to his farm by the mere fact of its being in proximity to the manufacturing unit; this in addition to his other advantages in having school, stores, hospital, and other community services and conveniences right at his front gate.

On the other hand, the dairyman living 15 miles away gets only his cream manufactured for his "supplier-shares." He pays 5d. per gallon to bring his cream to the factory, lives under harder conditions, and yet he is actually the greatest potential factor in the factory's economical progress by reason of the fact that increased cream production must come from farther out, for, as a rule, the near areas to the factory are producing up to their capacity. This can best be explained by the accompanying diagram showing concentric circles with the factory as the centre. As an example let us take the Maleny district.



It may be argued that the area within the middle radius should produce more than the inner one, and the country within the outer circle might be induced or developed to produce more than the two inner ones. One way of doing this is to take away some of the disabilities of the outer ring of farmers and make those within the inner circles contribute something to him out of the unearned value obtained by their having the factory so much closer to them.

By cutting the transportation costs of farmers in the outer ring it will encourage them to bring more country into cream production, and closer settlement, so I think it can be proved that the factory must look to its outer ring of dairymen for any increase in its output and economic business expansion.

### The Present System and a Suggestion for Improvement.

Ninety per cent. of the cream comes to the factory by lorry or wagon which is paid for by the supplier using such transport. The factory cheque is paid to the carrier and the account of each supplier is debited according to the amount of cream supplied by him. About 160 cartage accounts have to be kept by the factory,

and bookkeeping could be cut out under the co-operative cartage scheme. The remaining 10 per cent. is brought in by individual dairymen.

The scheme that I suggest is one whereby the factory takes control of the whole of the cream, splits the supply up into convenient units, making the supply to each unit as nearly equal as possible, and sets out conditions of cartage, time of starting, route, &c. Cream carters would be invited to tender for each unit.

The more distant farmers in the outer circle would have their transportation charges reduced by 50 per cent., and I estimate that the factory could get the whole of its supply on the platform for 2½d. per gallon during the term of, say, three or four years' contract, with the possibility of a reduction for the following term. The supplier would not be at the mercy of the carrier, and any complaints he might have would go direct to the factory management.

The factory would control the whole supply from farm to churn with, I think, advantage to the condition of the cream on arrival on the testing floor.

Finally, it would encourage production in areas remote from the factory, and it is to these more distant localities that the factory must look for its increased output. As set out in the beginning, such a system would provide another link in the chain of co-operation from the cow to the consumer.

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### FARM BUILDINGS—SITE AND ASPECT.

A very considerable proportion of disease and mortality can be more or less directly traced to errors in constructing the buildings in which animals live all or part of their time. Although for each kind of animal different considerations carry weight, yet there are certain principles common to the proper construction of all buildings intended to house stock.

In selecting the site for stables, cowsheds, and pig and calf pens some freedom of choice is generally offered to the farmer. These structures should not be placed on low-lying, swampy ground, or on ground liable to be flooded, or they will always be damp and probably associated with chills and rheumatism; while the animals, having to expend so much of their food in maintaining bodily warmth, will not thrive so well as those in drier and better situated buildings.

Buildings are better on higher land, which can more readily be drained. It is also desirable to take into consideration the dryness of the soil. A shallow soil with a clay subsoil, for example, is not the most suitable, and alluvial flats and "made soils" are unsuitable places on which to place buildings for stock.

This is often important—partly in relation to its effect on the health of stock and partly because it affects the comfort, not only of the animals, but of those working among them. Whenever possible, in most parts of this State, a southerly or westerly aspect should be avoided, and shelter from the south and west secured. Despite the great heat of summer in many parts of the State, more loss is certainly occasioned by the cold of winter, and anything in the housing of stock that tends to protect them from southerly or westerly winds is of advantage. Continued exposure to cold westerlies when the animals are confined in small pens which prevent them exercising themselves will rapidly lower their vitality and disease-resisting power, especially in the case of young stock, and will retard their development by forcing them to devote so much of their food toward the maintenance of body temperature.

In like manner the sudden changes of temperature which occur with southerly winds and winter storms are liable to produce catarrh and pneumonia in all classes of stock exposed to them, particularly when such exposure follows recent shearing or clipping, de-trucking after a long railway journey, sudden release from close confinement in a hot atmosphere, or over-heating from some other cause. After sudden falls in temperature or cold rain, semi-starvation often leads to heavy losses. Penned animals have no chance of taking advantage of shelter afforded by the ground and suffer accordingly.

The selection of an east, north-easterly, or northerly aspect has the further advantage of catching the morning sun in the winter and allowing sunlight to enter freely into buildings all the year round. The top of a ridge is never a good place for housing stock or placing cow-balls; on such a site the buildings are exposed to all the winds that blow.

## Answers to Correspondents.

### Stock Inoculation.

E.R. (Woroon).—Your questions are answered by the Chief Inspector of Stock, Major A. H. Cory, M.R.C.V.S., as follows:—

1. Will young cattle eighteen months and under get pleuro if they are allowed to run with cattle which have had it and are inoculated, or at what age?

Yes, animals can contract pleuro pneumonia contagiosa at any age if placed in contact with diseased animals.

2. Why must cattle be inoculated in the tail?

If the inoculation takes place in any other part of the body than the tail the disease progresses to such an extent that it usually kills the animal. Inoculation is carried out in the tip of the tail because the circulation of blood at that place is very weak compared with other parts of the body.

3. If tails are inoculated to-day and they fester and rot three days hence, will the beasts be immune or will they get pleuro?

If inoculated tails fester it goes to show that the inoculation has either been carried out in an unhygienic manner or that the virus was contaminated with pus organisms, when, in most cases, it is necessary to amputate the tail some two or three joints or inches above the seat of the pus formation.

4. Why not use other than needle and setons and inoculate the same as for redwater, and not touch the tail?

An ordinary hypodermic syringe used for inoculation of stock against redwater can be used in place of the setons in the tip of the tail, but only a few drops of virus are required.

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### BOTANY.

#### Trees for Bowenville.

R.H.F. (Bowenville).—The Government Botanist, Mr. Cyril White, F.L.S., advises:—

Perhaps the all-round best timber for you to grow in your district is the ordinary rough Ironbark (*Eucalyptus crebra*). Another timber that is extraordinarily lasting in the ground is the common Bloodwood (*Eucalyptus corymbosa*). Seeds of both these species are obtainable from Mr. A. Murphy, Wey Woy, N.S.W.

*Melaleuca lateritia* is a native of Western Australia. It is not listed in any of the State catalogues. Sometimes the Department of Agriculture at Perth has seeds of native plants available for distribution, and if you write to Mr. W. M. Carne, Botanist, Department of Agriculture, Perth, it is possible he may be able to send you some.

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### PIG RAISING.

*Replies selected from the outgoing mail of the Instructor in Pig Raising, Mr. E. J. Shelton.*

#### Treatment for Ailing Sow.

C.K. (Maleny).—

With regard to the sow which has been off colour for some time, we would suggest reducing the amount of mizemeal given to this animal and increasing the amount of green food, at the same time allowing her as much liberty as possible, so that she can spend her time grazing over succulent pasture and, in this way, picking up portion of her living. We would suggest doses of Epsom salts—two ounce packets given in the morning, fed for a day or two. This would freshen her up a good deal and be productive of some good. She should also have plenty of clean drinking water, some charcoal, and some bonemeal. (See reply to K.H.)

**A Suffering Sow.**

V.E.K. (Talleghalla)—

From your details the sow is suffering from paralysis of the hindquarters, due probably to impaction of the bowels. This form of paralysis is rather common, especially in dry times when there is a scarcity of laxative foods, such as greenstuff or skim milk. Continual feeding on dry food will cause constipation in pigs, and the constipation may be the indirect cause of boils; it also may affect the nervous system of the hindquarters, causing partial paralysis. Treatment.—Keep the sow in a dry, warm shed, with plenty of dry bedding. Feed her a sloppy diet containing skim milk, pollard, and a little maize, and as much succulent greenstuff as she will eat, preferably lucerne. A dose of castor oil, one-third cupful mixed with a small feed when she is hungry, would be very helpful. It may also be helpful to massage the hind parts from the loin down to the tail with turpentine and oil and plenty of rubbing. With careful treatment the sow should recover, but it would not be advisable to keep her as a breeder.

**Lice-infested Pigs.**

K.H. (Monto)—

Make up a mixture of half a pint of benzine, half a pint of kerosene, and seven pints of fish oil, crude oil, or old motor oil, and apply this to the pigs by means of a soft cloth attached to an ordinary household broom. If the oil was placed in a kerosene tin and the cloth dipped therein, you could use this mixture easily, although it would pay to give the animals individual attention, for there are places like the inside of the ears and round about the neck to which it is not easy to apply the oil in any other way than by hand. We do not think that it is payable to dip pigs in the same way as cattle, for they are hard to handle, and there is much risk associated with forcing them through a dip. It is much more convenient to treat them by hand, and takes considerably less time. Rubbing posts are also well worth trial. Good stout posts should be erected in the paddocks where the pigs are kept, and around these posts should be wrapped strong cornsacks, kept in position by a cord. The sacks should be saturated with oil occasionally. You will find that the pigs very soon learn to rub against this, and in this way they oil themselves.

**Arrowroot, "Sweet Bucks," and Artichokes for Pigs.**

INQUIRER (Toowoomba)—

The bulbs of the arrowroot plant have value as pig food. We prefer that these bulbs should be washed, cleaned, and thoroughly cooked, before being used as a food for pigs, particularly for very young stock, and in each instance it is preferable to use them in conjunction with skim milk and grain, like barley or maize, and green food.

From Mr. Brünnich's Bulletin on Stock Foods, and which has been posted to you, you will note the advice given on the use of various foods. The Agricultural Chemist stresses the importance of balancing the rations, more especially for young and fattening pigs, which do not usually have the advantage of green food in addition to their grain and other foods.

It is difficult to make a comparison between the actual feeding value of raw arrowroot bulbs and raw sweet potatoes, for the latter are more palatable to pigs (young stock particularly) than the former.

Both of these root crops have actually a better feeding value when boiled or steamed than when fed raw, this for the reason that the cooking renders them more appetising and the pigs consume more than they would if fed in the raw or uncooked state.

Argument as to whether it pays better to cook food for pigs than to feed it raw is a very old one. Even experimental tests have not demonstrated that it pays generally to cook all the food fed to swine.

The jelly-like substance resulting when boiled arrowroot bulbs and sweet potatoes are cooked is not harmful to pigs, provided they are given other foods in addition to the cooked roots.

Of course, from a paddock standpoint, the arrowroot lends itself well to hurdling off, particularly where a deep furrow is run out or the soil opened up close to the bulbs, so as to allow the pigs to work into the stool of roots from one side, but this system of feeding is not advocated for very young pigs, for the bulbs are somewhat tough, and the young pig would not eat

sufficient to maintain the required growth. Breeding sows and boars, in particular, would benefit by a system of feeding in this way.

Jerusalem artichokes are recommended for pig-feeding on the paddock system.

Yields of from 6 to 8 tons an acre may be expected in normal seasons, though on soils specially suited to this crop, much heavier yields may be obtained. The artichoke plant grows from 6 to 8 feet high, is of a sunflower type, with a profuse crop of miniature sunflower-like blooms. The special advantage of this crop is that one well established in good ground, careful cultivation and feeding off will result in a continuance of growth over several years. The roots are ready for use when the plant dies as winter approaches. The tubers left in the ground shoot again when spring returns, and all that is necessary is to plough and harrow the ground and put it into good condition for the future growth of the crop. In this way a crop of artichokes may be maintained for eight or nine years.

It may, of course, be necessary to replant areas that are eaten out and in this way provide for a sufficient number of plants on the area fenced off. It is preferable to let the pigs do their own harvesting when feeding off artichokes and, for this purpose, the crop should be hurdled or fenced off in suitable areas. A portable shelter shed and a water trough are also necessary, while it is equally necessary to balance the ration with nitrogenous crops, such as lucerne and other green foods, and with skim milk.

Ordinary swede turnips are not of the same value for pig-feeding purposes as they are for sheep, although they can be used. It would appear that it would pay handsomely for farmers to have small areas of arrowroot, artichokes and sweet potatoes, for all these crops are available during the winter months, when other foods are in short supply. They are all readily cultivated, and in normal seasons provide heavy yields of very succulent food.

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## TO PROTECT STORED GRAIN FROM RATS AND MICE.

The Minister for Agriculture and Stock, Mr. W. Forgan Smith, announced recently that mice and rodents have from time to time caused considerable damage to the cereal crops harvested in Queensland, and this department had occasionally been called upon for advice as to an efficacious means to check the damage to grain occasioned by these pests. In many cases the damage has been fairly considerable, and, in addition to the loss of grain actually consumed, a considerable quantity of grain is gnawed and the quality generally is depreciated. In the case of wheat which is stored in bags, the mice make holes in the bags and considerable quantities of wheat run from the bags and become deposited on the floor of the shed or on the ground beneath the stack. The wheat which is taken from the bags causes the stacks to collapse and renders it difficult to protect the stacks against the weather.

There are two ways in which stored grain may be protected against the depredations of vermin. One is to occasionally fumigate with charcoal fumes, and the other is the use of cyanogas (calcium cyanide). The use of cyanogas is comparatively simple and safe, and the residue left after the poisonous gas has been evolved is quite harmless, being nothing more or less than pure lime. The fumigation with calcium cyanide, which gives off slowly hydrocyanic acid gas, is a practical method of destroying both rats and mice in the grain shed or the wheat stack. The poisonous gas, although deadly to animal and insect life, is not absorbed to any extent by the wheat grain. **Naturally, every precaution must be taken that human beings do not come within the range of the calcium cyanide while poisonous gas fumes are being emitted from it.**

For a number of years past the control of mice and rats has attracted the attention of scientists, and in 1906 a preparation known as Dr. Danysz bacillus was tested in this State, but, unfortunately, the results did not prove satisfactory in the extermination of the vermin. About the same time a proprietary preparation, which was sold under the trade name of "Ozon," was experimented with, and the results in this case were also unsatisfactory.

There is, of course, necessity that in the introduction of organism causing disease to mice and rats, every precaution must be taken that the disease cannot possibly be contracted by humans or domestic animals.

From time to time reference has been made in the "Queensland Agricultural Journal"\* to the means by which rodents and mice might be kept in subjection.

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\* "Q.A.J.," vols. for 1915, 1917, and 1925.

## General Notes.

### Staff Changes and Appointments.

Constable H. A. Daly, of Tolga, has been appointed Inspector of Slaughter-houses.

Mr. H. F. Sibley, Inspector of Slaughter-houses, Charters Towers, has been appointed also Officer under and for the purposes of the Animals and Birds Acts.

Mr. E. P. Colyer, of Koorooeenah, Lowmead, has been appointed Officer under and for the purposes of "*The Animals and Birds Acts, 1921 to 1924.*"

Messrs. F. Dobson, A. J. Marks, and A. C. Randley, of Cedar Creek, Dayboro, have been appointed Honorary Inspectors under the Diseases in Plants Acts, and Mr. W. B. Christie, of Cooran, has been appointed Temporary Inspector under those Acts.

Mr. H. J. D. McBean, Stock Inspector, Pittsworth, has been appointed also Inspector of Brands.

### Additional Sanctuaries.

Talgi Holding, near Capella, and the property of Mr. E. P. Colyer, Koorooeenah, Lowmead, have been declared sanctuaries for animals and birds.

### Quality of Queensland Cheese.

A consignment of sixty-four crates of Queensland cheese, specially made for exhibition at the Nottingham Show, aroused great interest in Tooley street. As space had not been reserved in advance, the cheese could not be shown in Nottingham, and as an alternative it was opened in Tooley street. The trade declared that the cheese was the best ever received from Australia, and it has almost all been sold at prices averaging more than the current rates for New Zealand cheese.

### Dairy Quality of Friesians.

Figures are coming to hand regarding the production of the herds under the past year's Government test in Victoria. One Friesian herd in which there are six mature cows and eleven heifers shows the excellent average of over 1,200 gallons of milk and 431 lb. of butter-fat a head for their 273 days' test. This herd is in a district where there is no irrigation, and which experienced the dry weather conditions which so seriously affected the grazing over most of Victoria during the past year. Their fine average is thus another proof of the all-round dairy quality of Friesians, and their reliability for dairying under any seasonal conditions. Among this herd of seventeen head there were three mature cows which gave 630 lb., 634 lb., and 636 lb. of butter-fat respectively in their 273 days' test. Another mature cow gave 584 lb. of butter-fat in her term, while a junior three-year-old heifer gave 521 lb. of butter-fat, and a junior two-year-old gave 545 lb. of butter-fat respectively in their nine months' test. The ten best cows and heifers in the herd actually show a return of 1,470 gallons of milk and 527 lb. of butter-fat a head for their 273 days' test.

### A Plant Cane Precaution.

In connection with the clean seed nurseries for sugar-cane which have been established in the Atherton district, it is desired that no plants should leave that area except by a special permit of an inspector under the Diseases in Plants Acts. In order to give effect to this desire, a Proclamation has been issued, declaring that the removal of any plant or part of any plant of sugar-cane to be used for the purpose of planting will be permitted only under the authority, terms, and conditions contained in a permit issued by an inspector under the Acts.

### Pastoral Supplies.

The comprehensive display of fencing wire, groceries, wireless, and station supplies exhibited by the Queensland Pastoral Supplies, Limited, was awarded first order of merit at the Brisbane Show. Their exhibit gave the visitors a very good idea of the many lines that this firm carry, and how adequately they cater for the man on the land. They sell direct to the producer at wholesale rates, a policy which is becoming more appreciated every year. One of their latest lines is the "Pifco" Incandescent Kerosene Lamps. They also had on view the "Astor" Five-valve Neutrodyne set. The "Trafalgar" cold safe, another line in great demand in the country, was also on view. The length of wire sold annually by this firm would encircle Australia many times.

### Animal Nutrition—Departmental Investigation.

The Minister for Agriculture and Stock (Mr. W. Forgan Smith) has arranged for the Agricultural Chemist, Mr. J. C. Brännich, and the Instructor in Sheep and Wool, Mr. J. Carew, to visit some of the pastoral districts for the purpose of making special inquiries into nutrition matters.

Messrs. Brännich and Carew will be at Charters Towers from the 7th to the 12th September, at Hughenden from the 12th to the 17th, at Winton from the 17th to the 22nd, at Longreach from the 22nd to the 27th, at Emerald from the 27th September to the 2nd October, at Springsure from the 2nd to the 6th October. While in these districts, both officers will visit as many stations as possible, and at the conclusion of their inquiries will deliver addresses to interested pastoralists.

### Fruit Trees and White Ant Attack.

When cleaning land for orchards or vineyards great care should be exercised to remove all stumps and roots from the ground. Any white ants' nests in the vicinity should be destroyed. When trees become infested, cut out the damaged wood if possible. Avoid scarring the trees near the base as these scars are likely to induce white ant attack. Dead or dying infested trees should be removed and burnt. Where the roots are attacked the use of paradichloro-benzine or some other fumigant is suggested. This will destroy the white ants attacking the roots and in the adjacent soil, and will act for a time as a preventive.

To apply the paradichloro, dig a circular trench 3 to 4 inches deep at a distance of 6 inches from the trunk of the tree, and scatter 2 oz. of the fumigant on the bottom of this, afterwards filling in with soil. The fumigant is more active when the soil is warm than when it is cold, and is not effective when the soil is saturated with water. For young trees a dose of 1 oz. is sufficient. If necessary the treatment should be repeated.

### The Way of Scientific Achievements.

"Röntgen, examining his vacuum glow, did not foresee that he was to revolutionise surgical operations. But it is just the clear vision of one step which means progress—whither we know not, but nevertheless progress. Whilst many are flinging themselves blindly against the wall of mystery, here and there a leader can discern places where the wall is yielding, where attack can force an aperture. The light does not penetrate the aperture; it is sufficient if it illuminates the stone that has next to be loosened. We cannot ask more of a scientific leader than that his vision shall suffice for the next step. In the country of the blind the one-eyed man is king."—Professor A. Stanley Eddington, D.Sc., LL.D., F.R.S.

### The Dairy Farmers' Decalogue.

1. Thou shalt use a registered bred-for-production sire of thy breed.
2. Thou shalt join a milk-recording association and keep records on the individual cows in thy herd.
3. Thou shalt cull thy herd, for it is written that she that produceth not shall be cast out.
4. Thou shalt replenish thy herd with the heifers raised from thy best cows and thy purebred sire.
5. Thou shalt feed the individual members of thy herd according to their producing ability, for, to her that giveth shall be given, and from her that giveth not shall be taken away.
6. Thou shalt provide them with an abundance of such grains as are necessary to balance thy home-grown foods.
7. Thou shalt at all times provide thy cows with pure water that they may quench their thirst.
8. Thou shalt not condemn thy bull to die unless thou hast proven his daughters, for cursed is he who slays the sire of high producers.
9. Thou shalt not waste feed by exposing thy cows to the storms of winter, but shall keep them in clean, comfortable quarters.
10. Thou shalt not caress thy cow with the milking stool lest she smite thee with her hind foot and fail to give thee her full flow.

All these commandments shalt thou keep; for he that keepeth them not shall not enter into the promised land nor attain the goal of prosperity.—"The Cow Bell," Edmonton, Alberta (Canada).

### **Humus—How it Increases Fertility.**

The presence of humus in the soil increases fertility in a number of ways. In the first place, it absorbs and retains moisture in the soil, and prevents surface evaporation. A surface soil fairly rich in humus exercises much the same influence on the underlying soil as does a mulch of dead leaves or other vegetable matter. During dry spells, and under the influence of hot winds usually prevalent under such conditions, the loss of moisture from the soil under surface evaporation is enormous, and in soils destitute of humus this loss is so rapid as to result in the drying up of the soil and the wilting of the crops. The final result of such conditions is the formation of scalded spots and the complete removal of the fine surface soil in the form of dust.

The humus in the soil is the ingredient which is most subject to alteration and destruction, and under dry conditions it is more or less rapidly destroyed. As soon as it has lost its moisture and become dry, it is rapidly burnt out by the combined action of sun and air. So that it is exactly in those circumstances where its presence is most essential that it is most liable to destruction, and the necessity for renewing it is most urgent.

The presence of humus in the soil also tends to improve the texture of the soil, lightening it and loosening it, and preventing compaction of the surface. It is thus of special value in the amelioration of stiff soils.

It is the principal source of nitrogen in the soil, and by its decay under the influence of soil organisms, ammonium salts and nitrates are produced, which are the forms in which this important element is assimilated by the plant. It is of interest to remember that the humus of arid or semi-arid regions is richer in nitrogen than that of the moister districts. This is a point of great importance with reference to the potential fertility of these soils. In point of fact, from a variety of causes acting together, the soils of the dry climates are richer in plant-food of all kinds than are the soils in regions of greater rainfall, consequently nothing but the absence of water prevents these from being extremely reproductive. There is, therefore, no problem which exceeds in importance that of retaining in the soil the little moisture that it receives, and any operation that succeeds in arresting, even partially, the loss of that moisture deserves the most careful consideration.

### **“World’s Most Efficient Cow.”**

It was recently stated that a Canadian Ayrshire cow was the “World’s Most Efficient Cow” by reason of her production of 87,843 lb. milk in five years. This record, a very fine one, has time and again been beaten by Friesian cows. An Otago (New Zealand) Friesian, Burkeyje Sylvia Posch, produced 200,000 lb. milk in eleven and a-quarter years continuous milking. Rosevale Burkeyje Sylvia, a daughter of Burkeyje Sylvia Posch, has completed seven first-class Certificates of Record, with an average production of 632.56 lb. fat, and she is now eighty-three days on with her eighth test. Her total production to the end of January, 1928, is 122,528 lb. milk and 4,623.99 lb. butter-fat. The cow will be eleven years old next July.

Menavale Queen Bess, a Taranaki Friesian cow, now eight years old, has four first-class Certificates of Record, with a total production of 94,170.2 lb. milk and 3,493.78 lb. fat.

Grahamholm Colantha Segis Maid, Minnesota, U.S.A., holds a record for production of 100,458.9 lb. milk and 3,070.13 lb. fat in three years.

Adirondac Wietske Dairy Maid has Records of Production for four years, totalling 129,409.6 lb. milk and 4,192.55 lb. fat, or an average yearly production of 32,349.9 lb. milk and 1,048.13 lb. fat.

Clara Findley Second, a British Friesian, produced 98,240 lb. milk in four and a-half years (four lactation periods) and 3,261 lb. fat.

Oamastop Jenny, another British Friesian, is the first cow in Britain to complete five consecutive 20,000 lb. of milk annually. She is just ten years old, and her total yield to date is 136,780 lb. of milk.

No. 2A.—Dam under test yielded 301 lb. fat in 213 days, whilst her daughter, by a Friesian sire (not Topsy Princee), yielded 223 lb. fat in 259 days.

Systematic testing and the correct interpretation of figures alone enable a farmer to breed progressively. It is only too evident that one particular sire has produced daughters that are definitely superior to their dams, whilst the daughters of two other sires were just as definitely inferior to their dams.

The above evidence only goes to show that dairying without testing is utterly unsatisfactory, and that it is probably responsible for the poor circumstances in which many dairymen find themselves.

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## The Home and the Garden.

### KITCHEN GARDEN.

Our notes for this month will not vary much from those for September. Sowings may be made of most vegetables. We would not, however, advise the sowing of cauliflowers, as the hot season fast approaching will have a bad effect on their flowering. French beans, including butter beans, may be sown in all parts of the State. Lima and Madagascar beans should also be sown. Sow the dwarf Lima beans in rows 3 feet apart with 18 inches between the plants. The kitchen garden should be deeply dug, and the soil reduced to a fine tilth. Give the plants plenty of room, both in sowing and transplanting, otherwise the plants will be drawn and worthless. Thin out melon and cucumber plants. Spraying for fungoid diseases should be attended to, particularly all members of the *Cucurbitaceæ* and *Solanum* families, of which melons and tomatoes are representative examples. Give plenty of water and mulch tomatoes planted out last month. Asparagus beds will require plentiful watering and a good top-dressing of short manure. See our instructions in "Market Gardening," obtainable on application to the Under Secretary, Department of Agriculture and Stock. Rosella seeds may be sown this month. No farm should be without rosellas. They are easily grown, they bear heavily, they make an excellent preserve, and are infinitely preferable to the mulberry for puddings. The bark supplies a splendid tough fibre for tying up plants. The fruit also makes a delicious wine.

### FLOWER GARDEN.

The flower garden will now be showing the result of the care bestowed upon it during the past two months. The principal work to be done this month is the raking and stirring of the beds, staking, shading, and watering. Annuals may be sown as directed for last month. Plant tuberose, crinum, ismene, amaryllis, parratium, hermocallis, hippeastrum, dahlias, &c. Water seedlings well after planting, and shade for a few days. Roses should now be in full bloom. Keep free from aphids, and cut off all spent flowers. Get the lawn-mower out and keep the grass down. Hoe the borders well, and trim the grass edges.

## Orchard Notes for October.

### THE COASTAL DISTRICTS.

October is frequently a dry month over the greater part of Queensland, consequently the advice that has been given in the notes for August and September regarding the necessity of thorough cultivation to retain moisture is again emphasised, as, unless there is an adequate supply of moisture in the soil to meet the trees' requirements, the coming season's crop will be jeopardised, as the young fruit will fail to set.

Thorough cultivation of all orchards, vineyards, and plantations is therefore imperative if the weather is dry, as the soil must be kept in a state of perfect tilth, and no weeds of any kind must be allowed to grow, as they only act as pumps to draw out the moisture from the soil that is required by the trees or fruit-yielding plants. Should the trees show the slightest sign of the want of moisture, they should be given a thorough irrigation if there is any available means of doing so, as it is unwise to allow any fruit trees to suffer for want of water if there is a possibility of their being supplied with same. Intermittent growth, resulting from the tree or plant being well supplied with moisture at one time and starved at another, results in serious damage, as the vitality is lessened and the tree or plant is not so well able to ward off disease. A strong, healthy, vigorous tree is frequently able to resist disease, whereas when it has become debilitated through neglect, lack of moisture or plant food, it becomes an easy prey to many pests. If an irrigation is given, see that it is a good one and that the ground is soaked; a mere surface watering is often more or less injurious, as it is apt to encourage a false growth which will not last, and also to bring the feeding roots to the surface, where they are not required, as they only die out with a dry spell and are in the way of cultivation.

Irrigation should always be followed by cultivation, so as to prevent surface evaporation and thus retain the moisture in the soil.

All newly planted trees should be carefully attended to, and if they show the slightest sign of scale insects or other pests they should receive attention at once. All growth not necessary to form the future tree should be removed, such as any growths on the main stem or main branches that are not required, as if this is done now it will not only save work later on, but will tend to throw the whole strength of the tree into the production of those limbs that will form the permanent framework of the tree. In older trees all water sprouts or other similar unnecessary growths should be removed.

Keep a good lookout for scales hatching out, and treat them before they have become firmly established and are coated with their protective covering, as they are very easily killed in their early stages, and consequently much weaker sprays can be used. The best remedies to use for young scales hatching out are those that kill the insects by coming in contact with them, such as miscible oils, which can be applied at a strength of 1 part of oil in 40 parts of spraying material and will do more good than a winter spray of double the strength. In the use of miscible oils or kerosene emulsion, always follow the directions given for the use of these spraying materials, and never apply them to evergreen trees when they are showing signs of distress resulting from a lack of moisture in the soil, as they are then likely to injure the tree, whereas if the tree is in vigorous growth they will do no harm whatever.

All leaf-eating insects should be kept in check by the use of an arsenate of lead spray, taking care to apply it as soon as the damage appears, and not to wait till the crop is ruined. Crops, such as all kinds of cucurbitaceous plants, tomatoes, and potatoes are often seriously injured by these insects, and the loss occasioned thereby can be prevented by spraying in time. In the case of tomatoes and potatoes, a combined spray of Bordeaux or Burgundy mixture and arsenate of lead should be used, as it will serve the dual purpose of destroying leaf-eating insects and of protecting the plants from the attack of Irish blight.

Grape vines require careful attention, and, if not already sprayed with Bordeaux mixture, no time should be lost in applying this material, as the only reliable method of checking such disease as anthracnose or black spot and downy mildew is to protect the wood and foliage from the attack of these diseases by providing a spray covering that will destroy any spores that may come in contact with them. The planting of bananas and pineapples can be continued during this month. See that the land is properly prepared and that good healthy suckers only are used. Keep the plantations well worked, and allow no weed growth. Keep a very careful lookout for fruit flies; destroy every mature insect you can, and gather and destroy every fallen fruit. If this is done systematically by all growers early in the season the subsequent crop of flies will be very materially decreased. See that all fruit sent to market during the month is carefully handled, properly graded, and well packed—not topped, but that the sample right through the case or lot is the same as that of the exposed surface.

## THE GRANITE BELT, SOUTHERN AND CENTRAL TABLELANDS.

Much of the matter contained under the heading of "The Coast Districts" applies equally to these parts of the State, as on the spring treatment that the orchard and vineyard receives the succeeding crop of fruit is very largely dependent. All orchards and vineyards must be kept in a state of perfect tilth, and no weed growth of any kind should be allowed. In the Western districts, irrigation should be given whenever necessary, but growers should not depend on irrigation alone, but should combine it with the thorough cultivation of the land so as to form and keep a fine soil mulch that will prevent surface evaporation.

All newly planted trees should be carefully looked after and only permitted to grow the branches required to form the future tree. All others should be removed as soon as they make their appearance. If there is any sign of woolly aphis, peach aphis, or scale insects, or of any fungus diseases on the young trees, these diseases should be dealt with at once by the use of such remedies as black leaf forty, Bordeaux mixture, or a weak oil emulsion. In older trees, similar pests should be systematically fought, as if kept in check at the beginning of the season the crop of fruit will not suffer to any appreciable extent. Where brown rot has been present in previous years, two or more sprayings with Bordeaux mixture can be tried, as they will tend to check other fungus growths, but at the same time the sodium or potassium sulphide sprays are more effectual for this particular disease and should be

used in preference when the fruit is nearly full grown. All pear, apple, and quince trees should be sprayed with arsenate of lead—first when the blossom is falling, and at intervals of about three weeks. Spraying for codlin moth is compulsory in the fruit district of Stanthorpe, and wherever pomaceous fruit are grown it must be attended to if this insect is to be kept in check.

In the warmer parts a careful check should be kept for any appearance of the fruit fly, and, should it be found, every effort should be made to trap the mature insect and to gather and destroy any affected fruit. If this is done, there is a good chance of saving the earlier ripening summer fruits, if not the bulk of the crop. Tomato and potato crops will require spraying with Bordeaux mixture, as also will grape vines. Keep a very strict watch on all grape vines, and, if they have not already been treated, don't delay a day in spraying if any sign of an oil spot, the first indication of downy mildew, appears on the top surface of the leaf. Spraying with Bordeaux mixture at once, and following the first spraying up with subsequent sprayings, if necessary, will save the crop, but if this is not done and the season is favourable for the development of the particular fungus causing this disease, growers can rest assured that their grape crop won't take long to harvest.

Where new vineyards have been planted, spraying is also very necessary, as if this is not done the young leaves and growth are apt to be so badly affected that the plant dies.

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## Farm Notes for October.

FIELD.—With the advent of warmer weather and the consequent increase in the soil temperature, weeds will make great headway if not checked; therefore our advice for last month holds good with even greater force for the coming month. Earth up any crops which may require it, and keep the soil loose among them. Sow maize, cowpeas, sorghums, millet, panicums, pumpkins, melons, cucumbers, marrows. Plant sweet potatoes, yams, peanuts, arrowroot, turmeric, chicory, and ginger. Coffee plants may be planted out. There are voluminous articles in previous journals giving full instructions how to manage coffee plants, from preparing the ground to harvesting the crop, to which our readers are referred.

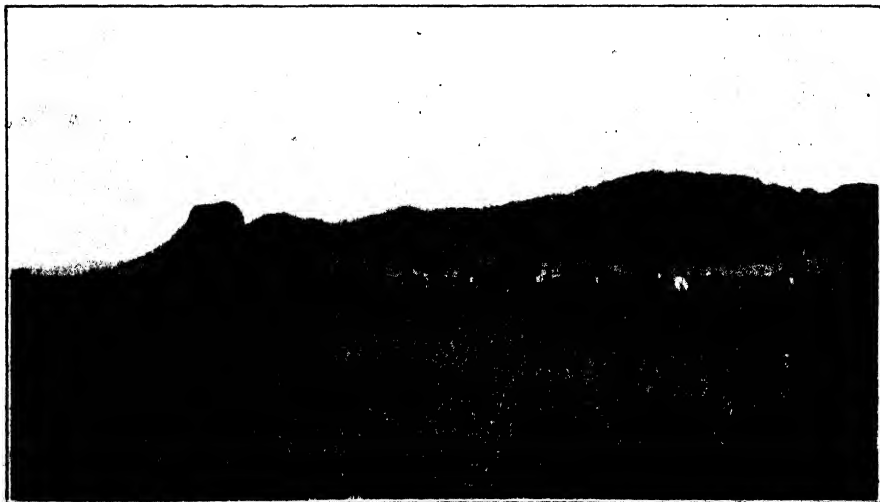


Photo.: Miss J. Easton.]

PLATE 82.—RICH PASTURES SHADOWED BY MINTO CRAIG ON COOCHIN COOCHIN.

**ASTRONOMICAL DATA FOR QUEENSLAND.**

TIMES COMPUTED BY D. EGLINTON, F.R.A.S., AND A. C. EGLINTON.

**TIMES OF SUNRISE, SUNSET, AND MOONRISE.****AT WARWICK.****MOONRISE.**

Date.	September, 1928.		October, 1928.		Sept., 1928.		Oct., 1928.	
	Rises.	Sets.	Rises.	Sets.	Rises.	Sets.	Rises.	Sets.
1	6.7	5.36	5.34	5.50	6.45	7.42	p.m.	p.m.
2	6.6	5.37	5.33	5.51	7.46	7.42		
3	6.5	5.37	5.32	5.52	8.49	8.49		
4	6.4	5.38	5.31	5.52	9.54	9.58		
5	6.2	5.38	5.29	5.53	10.59	11.5		
6	6.1	5.39	5.28	5.53	...	12.10	a.m.	a.m.
7	6.0	5.40	5.27	5.54	12.8	1.11		
8	5.59	5.40	5.25	5.54	1.24	2.6		
9	5.58	5.41	5.24	5.55	2.26	2.50		
10	5.57	5.41	5.23	5.55	3.24	3.30		
11	5.56	5.42	5.22	5.55	4.6	4.4		
12	5.54	5.43	5.22	5.56	4.47	4.36		
13	5.53	5.43	5.21	5.56	5.29	5.6		
14	5.52	5.44	5.20	5.57	6.3	5.36		
15	5.51	5.44	5.19	5.57	6.35	6.7		
16	5.50	5.45	5.18	5.58	7.5	6.37		
17	5.48	5.45	5.17	5.59	7.35	7.11		
18	5.47	5.46	5.16	5.59	8.5	7.50		
19	5.46	5.46	5.14	6.0	8.39	8.35		
20	5.45	5.46	5.13	6.1	9.14	9.23		
21	5.44	5.47	5.12	6.1	9.54	10.14		
22	5.43	5.47	5.11	6.2	10.40	11.5		
23	5.42	5.47	5.10	6.2	11.30	12.5	p.m.	p.m.
24	5.41	5.47	5.9	6.3	12.23	1.6		
25	5.40	5.48	5.8	6.4	1.20	2.8	p.m.	p.m.
26	5.38	5.48	5.7	6.4	2.23	3.11		
27	5.37	5.48	5.7	6.5	3.25	4.13		
28	5.36	5.49	5.6	6.6	4.28	5.19		
29	5.35	5.49	5.5	6.6	5.30	6.28		
30	5.34	5.50	5.4	6.7	6.35	7.39		
31	...	...	5.4	6.8	...	8.51		

**Phases of the Moon, Occultations, &c.**

The times stated are for Queensland, New South Wales, Victoria, and Tasmania.

7 Sept. ) Last Quarter 8 35 a.m.  
 14 " ) ● New Moon 11 21 p.m.  
 22 " ) ( First Quarter 12 58 p.m.  
 30 " ) ○ Full Moon 10 42 p.m.

Perigee, 5th September, at 3.18 a.m.

Apogee, 12th September, at midday.

The occultation of Tan Tauri, magnitude 4.3, will occur at Brisbane, Toowoomba, and Warwick about 3.30 a.m. on the 7th, but about half-an-hour earlier in North Queensland. The reappearance of the star near the southern edge of the Moon will occur in Southern Queensland within about ten minutes of its disappearance, but in the north the time will be extended by as much as an hour.

The planets Mercury and Venus will be in apparent juxtaposition on the 10th, also on the 9th and the 11th, but to a somewhat less extent. They will be seen in the western sky about half-an-hour or more after sunset: but both planets, being on the far side of their orbits, will not be seen to the best advantage, neither planet being near its maximum brightness.

Phi Orphinci will be occulted at Rockhampton and throughout Northern Queensland on the 21st—at Rockhampton at about 7.45 p.m., and the star will reappear between four and five minutes later. At Cairns the occultation will take place about eighteen minutes earlier, and reappear proportionately later.

Psi Sagittarii, magnitude 4.8, will be occulted on the 23rd, about 10.25 p.m., at places in Southern Queensland, and about a quarter of an hour later at Rockhampton, while at Cairns the occultation will be very slight, if visible at all, a few minutes before 11 o'clock.

The Sun will set at the nearest point to due west on the 23rd, and rise at the nearest point to due east on the 24th. If these points are carefully noted they will be of value.

Mercury will be at its greatest elongation, 23 degrees east of the Sun on the 29th, when it will not set until one hour fifty-eight minutes after the Sun.

6 Oct. ) Last Quarter 3 6 p.m.  
 14 " ) ● New Moon 1 56 a.m.  
 22 " ) ( First Quarter 7 6 a.m.  
 29 " ) ○ Full Moon 8 4 a.m.

Perigee, 2nd October, at 8 0 a.m.

Apogee, 18th October, at 6 6 a.m.

Perigee, 30th October, at 11 54 a.m.

The occultation of the giant planet Jupiter by the Moon will take place about 3.20 a.m. on October 2nd at Warwick and Toowoomba, near the western horizon, and will be best seen with binoculars or telescope on account of the brightness of the full Moon. It will also be occulted soon after 8 a.m. on the 29th when both are below the western horizon.

A small star in Taurus will be occulted by the Moon on the night of the 3rd, about 43 minutes after midnight at Maryborough, but at Gympie the star will probably be only just grazing the southern edge of the Moon.

For places west of Warwick and nearly in the same latitude, 28 degrees 12 minutes S., add 4 minutes for each degree of longitude. For example, at Inglewood, add 4 minutes to the times given above for Warwick; at Goondiwindi, add 8 minutes; at St. George, 14 minutes; at Cunnamulla, 25 minutes; at Thargomindah, 33 minutes; and at Oontoo, 43 minutes.

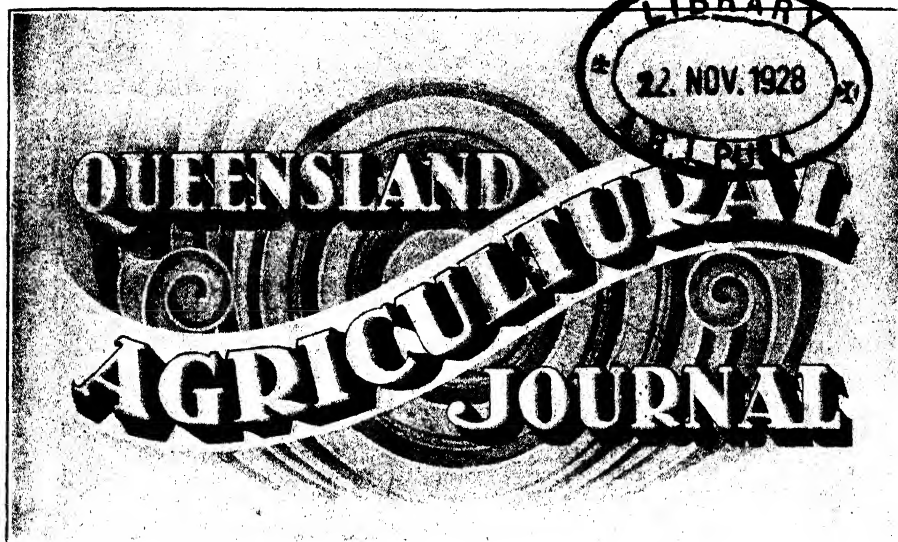
The moonlight nights for each month can best be ascertained by noticing the dates when the moon will be in the first quarter and when full. In the latter case the moon will rise somewhat about the time the sun sets, and the moonlight then extends all through the night; when at the first quarter the moon rises somewhere about six hours before the sun sets, and it is moonlight only till about midnight. After full moon it will be later each evening before it rises, and when in the last quarter it will not generally rise till after midnight.

It must be remembered that the times referred to are only roughly approximate, as the relative positions of the sun and moon vary considerably.

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1 OCTOBER, 1928.

PART 4

## Event and Comment.

### Agricultural Progress in Queensland.

THE Annual Report of the Department of Agriculture and Stock, which was presented to Parliament by the Minister, Mr. W. Forgan Smith, in the course of the month, contains much valuable and interesting information on the development, extension, and general progress of primary industries in Queensland. Reviewing the position of agriculture in the State, the Under Secretary, Mr. E. Graham, said: On all sides there are indications of healthy expansion, and a general improvement in the agricultural situation within the State marked the period under review. This was due to bountiful and well-distributed rains over most of the farming areas.

Certain districts, however, suffered reverses as a result of an excessively wet season. Serious floods, attended with regrettable loss of life, occurred in the Central Division. Besides the loss of valuable lives, which he recorded with deep regret, much material damage and destruction of live stock occurred in some of the flooded country. The season otherwise was generally favourable.

### Conditions in Divisional Areas.

IN the Southern Division autumn rains encouraged an extension of cropping in the wheat areas, particularly on the Darling Downs. Early winter precipitations were lighter throughout the Downs and the Maranoon, with the result that the first promise of a good wheat germination was not entirely fulfilled. The country immediately west of the main Dividing Range was more favoured, beneficial spring rains ensuring satisfactory yields.

The months of October, November, and December were remarkable for a succession of very wet weeks which delayed harvesting and December had nearly ended before the last of the crop was in the bag. Though the continued rains had given rise to some apprehension, ultimate yields proved that the damage to the wheat crop was quite negligible. As a matter of fact, early estimates were, in many instances, well below actual production.

Wheat pool deliveries amounted to 3,575,000 bushels, and when due allowance is made for reservations for seed and feed the 1927 harvest was little less than four million bushels.

Other crops in the Southern Division responded well to the favourable season, though they suffered later from excessive wet weather. The early maize harvest was the heaviest for some years. Late planted crops were affected by serious floods in some of the maize-growing regions. Estimates, in consequence, were not always realised. A visitation of mice caused a further reduction in the aggregate maize return which was approximately four million bushels.

Agricultural operations in the Central Division were interrupted or retarded by heavy and continuous summer rains which exceeded the average falls in most of the farming districts. Otherwise the season in Central Queensland was generally favourable and satisfactory yields of cotton and other crops were obtained. There again earlier forecasts were not fulfilled on account of excessive soil saturation and insufficient sunshine during the growing period.

In the Northern Division similar conditions prevailed in the agricultural areas.

The general revival from seasonal reverses in some of the farming districts again demonstrated the remarkable recuperative powers of the State.

Among the first grain harvested for the year on the Darling Downs was a field of "Novo" wheat which was propagated and distributed the previous year under the departmental wheat propagation plot scheme. The yield, 40 bushels, was an early indication that the season was to be one of production beyond the ordinary. Many crops returned from 40 to 50 bushels an acre, the highest recorded yield being 66½ bushels. In obtaining these results no fertilisers whatever were used.

The quality of Queensland wheat was proved in competition with grain from every State at the last Royal Show in Sydney where Downs growers gained a substantial share of the honours.

From results obtained it is evident that the wheat-breeding work at the Roma State Farm is having an important influence on the establishment and extension of the wheat industry in this State. It is also apparent that as a fodder and grain crop wheat is receiving much more attention from Queensland producers.

The departmental wheat propagation scheme, in which the Wheat Board is also interested, is proving its value generally as a means of bringing improved varieties into cultivation and also maintaining the types commonly cultivated in this State. An encouraging aspect of this work was the success achieved by growers who secured seed of varieties bred on the Roma State Farm and which was distributed by the Department. Details of this important work are set out in another section of this report.

It is noteworthy that the comparatively heavy yields on the Downs, which were produced without the use of manufactured manures, were largely the result of the more general application of better methods of cultivation.

Good progress is being made in the development of the new strain of "Durum" maize on the Atherton Tableland, to which I referred at length in my last report. By careful selection work, in which the botanical and other characteristics required in seed plants are studied very closely, a special type of grain is gradually being evolved. It is now possible to extend this propagation work on a thousand-acre unit basis. The aim in view is to provide sufficient seed of this new maize to meet all Northern Tableland requirements.

Progressive experimental and other investigational work on tobacco cultivation in the North is proceeding satisfactorily.

Peanut production is approaching the limit of consumption and efforts are now being directed towards encouraging the more general use of the "nut" as a dietary article; and also a wider exploitation of its oil properties.

The provision of storage facilities and the installation of modern machinery at an approximate cost of £50,000 is engaging the attention of the Peanut Pool Board at Kingaroy. This is an indication of the progressive spirit animating those associated with this new industry.

As the result of experimental work in the Northern Division it has been ascertained that potatoes harvested in September may be kept in cold storage for five

months at a temperature ranging from 34 to 40 deg. F. and planted after the wet season in the following April. This suggests the possibility of producing a winter potato crop in North Queensland. It has been ascertained, too, that potatoes grown on the temperate tablelands are suitable as seed for our tropical coastal regions, also that a reciprocal arrangement in respect to a continuity of seed supplies in the North is quite practicable.

Good results are accruing from the operation of the scheme for the improvement of farm horses. Since its inception in 1923-24 over fifteen hundred services have been recorded. The State stallions have left their mark in every district in which they have been utilised and many of their stock have already won distinction in the show ring. Draught horses of good type still command good prices throughout the Commonwealth, and the desirability of improving the breed within the State by continuing this useful service to the farmer is evident.

### **The Journal and Departmental Publicity.**

**A**FTER covering the whole range of agricultural activity, the Report goes on to say that additional information on the science, economics, and practice of agriculture is being collected continuously by the Department through research, field observations and experiments, and laboratory work, and this knowledge would be of little value to farmers and others concerned if it were not made available to them in a readable and digestible form. In this connection the "Queensland Agricultural Journal" and Departmental publications perform a useful service.

Officers engaged in directive, educative, and specialised work have made full use of the media at their disposal, and it is due to the regularity and practical value of their contributions that the Journal has become an acknowledged authority on the industry it efficiently serves; and that this and other Departmental publications have an ever-widening circulation. As a publication dealing with the principles and practice of agriculture in this State the Journal has proved of definite value to those engaged in primary production, and there is evidence that it is appreciated accordingly.

Many new or revised bulletins and pamphlets on subjects of especial cultural or scientific importance were published by the Department in the course of the year.

Departmental officers have also contributed to a comprehensive radio programme in co-operation with the Queensland Government Radio Service. Lectures so delivered consisted of brief digests of seasonal information, facts, and general educational matter prepared in narrative form and covering a wide range of topics.

The making and releasing of a series of cinematographic films, showing the development, progress, and present standards of our chief primary industries, was also an important feature of the Department's publicity work. In addition numerous photographic prints, depicting the various phases of country life and its wealth and progress in Queensland, were also distributed through approved channels.

Information of a strictly news nature relating to the agricultural situation, Departmental activities, and seasonal notes on farming practice, plant and animal pests and diseases, is prepared and issued regularly to the metropolitan and country Press.

There is ample evidence that agricultural news is regarded as of general and increasing importance, and more space is being apportioned by the daily Press to notes and informative articles on the industry. This is a very healthy sign.

### **A Better-Balanced Industry.**

**T**HE present situation of agriculture in Queensland reveals a general tendency towards a better balanced industry. Much more study is being given to the economics of agriculture. Farmers are realising that a season of heavy production does not necessarily mean the attainment of a full measure of prosperity, for price problems are immediately created by over-supplied markets. In much recent discussion the fact has been stressed that the surplus problem is at the root of the farmers' difficulties. There are two obvious lines of approach to this problem—namely, through balancing output with market requirements, and systematised marketing. Much thought is being given to the subject, but it is obvious that no general formula will cover all commodities and conditions in all parts of the State. Every district and every commodity has its special marketing difficulties awaiting complete solution. Through concentrated and co-ordinated effort, aided by appropriate legislation favouring the industry in Queensland, much is being attempted towards evolving a satisfactory system of orderly marketing which will benefit both the producer and the consumer.

## Bureau of Sugar Experiment Stations.

### CANE PESTS AND DISEASES.

Mr. A. N. Burns, Assistant Entomologist at Mackay, has submitted the following report for the month ended 12th September, 1928, to the Director of the Bureau of Sugar Experiment Stations, Mr. H. T. Easterby:—

#### Increase of Army Worm (Several Species) Damage.

Damage from these pests commenced to show up a few weeks ago in young ratoon cane, but was caused by one species only, *Cirphis loreyi* Dup., the lesser army worm. Within the last two weeks, however, a good deal of injury has shown up in places, so far ratoon cane only being affected. Numerous larvæ of the true army worm, *Cirphis unipuncta* Haw., also *C. loreyi*, another species, probably *Prodenia escripta*, and two other species that have not previously come under the writer's notice as feeding on sugar-cane, have been collected in the vicinity of the Laboratory. Large numbers are being bred to obtain their natural parasites; however to date no parasites have emerged.

Infestation in each instance appears to be fairly local, and the areas attacked are extensive. The injury to the cane leaves can be readily seen from a considerable distance. As many as eight larvæ have been collected when sheltering in the central leaves of one cane shoot; this number might not have actually been the total number attacking that particular cane plant, as many caterpillars hide under clods of earth, in crevices, and under debris, &c.

The larva of the true army worm, *C. unipuncta* Haw., differs fairly considerably from the caterpillar of the lesser army worm, *C. loreyi* Dup. A brief description is as follows:—Length, approximately 1½ inches. Dorsal and subdorsal area dark smoky brown or black suffused greenish. Dorsal line lighter in colour, and edged on either side with a thin black line; midway between this and the subdorsal stripe on either side is another longitudinal black stripe, and in the subdorsal area on each side a broad blackish longitudinal stripe. Immediately below this is a broad pinkish grey or pale brownish broad lateral stripe, above which is situated the spiracles, one to each segment, very minute, black. Ventral area dull greyish or yellowish green. Legs yellowish brown, pro-legs and claspers yellowish green, black at and near their terminations. Head, shiny brown with two black bands extending from the vertex to the mandibles. Between these, and on their outer sides are a few scattered black dots, giving the head a slightly mottled appearance.

These caterpillars are very voracious feeders, and in consequence they grow very fast, attaining at the present time their total larval development in less than three weeks. Individual larvæ vary very considerably in the intensity of their coloration, the range of colour being from dark greenish black to pale yellowish or greyish green, more or less suffused with black. Pupation takes place in the soil, the larva constructing a loose cocoon made of soil particles, &c., held together with a few silken threads. The pupa or chrysalis measures about ¾ of an inch in length, and is dark ochreous brown in colour. The time occupied in this stage is brief, ranging from twelve to twenty-one days, according to the season of the year; development is more rapid during the warmer months.

The adult moth measures from 1½ to 1¾ inch across the expanded wings, and is coloured as follows:—

**Forewings (above):** Yellowish or reddish brown, obscurely marked with minute blackish dots and patches. Near the centre of the wing at the outer end of cell is a small whitish spot circled blackish.

**Hindwings (above):** Pale yellowish brown suffused blackish near the outer edges, the suffusion being darkest nearest the edges. Veins brown-black, clearly defined. Wings with a pearly opalescence, when viewed from certain angles.

**Forewings (beneath):** As above but paler, yellowish grey towards apex and outer edges, an obscure smoky patch bordering edges and end of cell.

**Hindwings (beneath):** Pale yellowish brown suffused silvery grey, dusted with scattered and very minute darker dots. A few small black spots along cilia at edges except near lower angle.

Control measures recommended in last month's report for larvæ of *C. loreyi* will also serve to efficiently control this, and any other leaf-eating species of army worm attacking sugar-cane.

### Apparent Scarcity of Digger Wasp Parasites of Cane Grubs.

For some months past specimens of these useful parasites have been sought after to breed under artificial conditions at the Laboratory, also to obtain data regarding their life-cycles and habits in the Mackay district. No specimens at all were observed during the late summer months, and it is only lately that any specimens have come under observation.

Farther north, in the Cairns district, numbers of these wasps could be taken at any time feeding from the nectar of flowering weeds growing along the headlands of canefields; but the few examples taken by the writer in this district have either been captured on the wing whilst flying over fallow land, or from the foliage of a scrub-tree growing near the Laboratory.

Two abundant species of these digger wasps occur in northern canefields; *Campsomeris tasmanianensis* Sauss. and *Campsomeris radula* Fabr., and all the specimens but one taken in this district were of the latter species. Another factor which tends to prove their scarcity is that whilst following ploughing operations in grub-infested canefields in different parts of the district, on two occasions only have their cocoons been collected, and then one only in each instance.

The female digger wasp after entering the soil and locating a third-stage grub of the greyback (*Lepidoderma albobirtum* Waterh.) or frenchi (*Lepidiota frenchi* Blkb.) cane beetle, seizes its victim and inserts its sting into the ventral portion of the grub's thorax, thus paralysing it, but not killing it. The wasp then lays its egg on the ventral surface of the grub's abdomen, usually on the sixth segment. In about three days' time the wasp egg hatches, and the young wasp larva or maggot inserts its head into its host's body and so sucks out the interior substances, leaving, when it is fully fed, in about a week or so, only the shrivelled skin of the cane grub. The wasp larva now spins a brown parchment-like cocoon, in which it transforms into the chrysalis stage, emerging a few weeks later as a perfect wasp.

These digger wasp parasites are themselves controlled naturally by hyperparasites; i.e., insects which are parasitic on them. These hyperparasites attack the wasp in its larval or maggot stage, and the two most common of these are the larvæ of Bombylid or Bee Fly, and the grub of a beetle belonging to the family Rhipiphoridae (feather-horned beetles).

In this district digger wasps appear to be controlled naturally to a very considerable extent, from the evidence that so few have been observed, and that a large Bombylid Fly (*Hyperalonia funesta*?) is very plentiful at times in canefields. Large numbers of these flies were seen, and many captured in the Station grounds during the later summer and early winter months.

### Predaceous Enemies of Cane Grubs.

During the past few weeks examples of larvæ of Asilid or "robber flies" have been brought to the Experiment Station, and have also been observed during cultural operations in canefields.

Growers may often observe whilst ploughing, a long white, fairly hard, legless grub or maggot, with a minute black, pointed head. These are beneficial insects, and are the larval or maggot stage of an Asilid fly. The adult flies are usually some shade of brown or brownish black, with fairly long legs, and rather elongate bodies. They are usually about an inch in length, though some species are considerably larger. They make a conspicuous buzzing whilst in flight, but settle frequently, usually on sticks, fence posts, &c., and they somewhat resemble some species of wasps. The female fly lays her eggs in a mass of foliage, sometimes on a blade of grass or a cane leaf. The young maggots on emergence make their way through the soil till they locate cane grubs, which they pierce by means of their sharp heads, and suck out the juices from the grub's body. These fly larvæ account for many cane grubs during the period of their larval development, and probably other species of beetle grubs also fall victims to them.

Two species of Asilid flies occur freely in this district, one, a little over an inch in length and expanse of wing, much resembles a well-known species (*Promachus doddi*, Bezzi) from the Cairns district. The other species is considerably larger, but is not quite as plentiful as the smaller one.

Attempts are being made at the Laboratory to breed through some of these fly larvæ in order to be able to determine correctly the identity of the species and their different larvæ.

## ENTOMOLOGY FOR THE YOUNG FARMER.

By EDMUND JARVIS, Entomologist.

*Mr. Jarvis, Entomologist at Meringa, near Cairns, has submitted to the Director of the Bureau of Sugar Experiment Stations, Mr. H. T. Easterby, the following report for the period August to September, 1928. He discusses among other topics some advantages likely to be derived by the sons of canegrowers from an elementary study of sugar-cane entomology.*

### Entomology has Attractions for the Rising Generation.

In an article appearing in the Press recently it was stated that in a district like that of Cairns, "where the growth of sugar-cane is of paramount importance, it is vital that we understand the creatures that attack the cane." The present writer is much in sympathy with any form of activity calculated to encourage among young people of the Cairns district a liking for nature study, and particularly for those branches of science directly associated with the sugar industry, which would naturally possess an interest to all concerned in its future welfare.

About twenty-five years ago Mr. Frank Tate (late Director of Education) introduced nature study into the curriculum of the Victorian State Schools. Each head teacher was asked to form a small museum of natural objects, built up from the material brought in by the children from day to day; the specimens collected (whether animal, vegetable, or mineral) being afterwards named and exhibited in one of the classrooms in suitable glass-topped cases.

It may be mentioned in this connection that good work is at present being carried out at the Gordonvale State School, where the children are encouraged to help to beautify portions of the school ground by growing ornamental trees, flowers, and shrubs. Such disinterested wholehearted work, while calling for the exercise of patience, care, and forethought, can hardly fail to develop in the children characters of unselfishness, together with a love of form, colour, and other natural beauties. "Learning by doing" is one of the watchwords among boy scouts, and might well apply also to school children.

Attempts have recently been made in America to interest their boy scouts in entomology. A prominent naturalist in the Oakland district (Brighton C. Cain, M.A.) tells us that "since scouting and outing go hand in hand, a subject like entomology is admirably suited to the scout method of training." "A very important factor," he remarks, "in building character is the bringing of the individual into better understanding and appreciation of the unfathomable beauties of Nature, and of Nature's God. Where in all the world about us is there a more wonderful field than Entomology for just this sort of thing? With the seemingly limitless variety of forms, the vast arrangement of colours, the great diversity of habits, and the marvellous inter-relationships presented by the insect world, what a golden opportunity is ours for instilling *real* reverence in the boys of to-day who will soon be 'the men of to-morrow.'"

Before a boy can obtain an "Insect Life" Merit Badge he must show a box of fifty different insects, collected, mounted, and labelled by himself; and must have reared at least one species of insect through all of its life-cycle stages of growth; and, moreover, be able to go into the field or forest and point out a large number of species in their natural haunt. Similarly, research work of this nature could be made attractive to the sons of our canegrowers, by organising regular rambles or excursions through cane areas and adjoining forests in search of destructive and beneficial insects, &c.

I need hardly state that the Bureau of Sugar Experiment Stations is keenly interested in any form of activity having for its object the spread of scientific information respecting cane insects and their associates. Every encouragement will be afforded to children or others desiring to make such collections of insects. The names of any specimens can be supplied from the official collection at Meringa Experiment Station, where, at the same time, full information may be obtained, if required, as to approved ways of capturing insects, killing, handling, setting, mounting, preserving, and protecting them from dust, ants, cockroaches, &c.; and with regard to the apparatus needed by a young collector.

### "Army Worm" Control.

During the months of August to October cane is likely to be damaged by caterpillars of the noctuid moths *Laphygma exempta* Walk., *Cirphis unipuncta* Haw., and *C. loreyi* Dup. The present season has been very favourable to the increase of these so-called "grass caterpillars" and "army worms," outbreaks of which have been reported from canefields in the Babinda, South Johnstone, and Cairns districts.

Much has been written concerning "Caterpillar Plague" and "Cutworms," under which general headings the larvae of several of our noctuid moths are classed. Three of these happen to be cane pests, while several other species wage a continual warfare against market gardeners and fruitgrowers.

Having already briefly described and figured the species affecting cane (Bulletin No. 3 of Sugar Bureau, Div. of Ent., second edition, revised, pp. 35-42), I shall only touch at present on those control measures which have proved to be the cheapest and most effective against such caterpillars.

### Recommendations.

In the event of big stools of cane being attacked, the trouble does not, as a rule, call for treatment unless the caterpillars chance to be only half-grown (about  $\frac{1}{2}$  of an inch long), and present in alarming numbers. Should an infestation of this kind, however, be noticed amongst young plant or ratoon shoots about 12 inches in height, no time must be lost before fighting the pest.

### Methods of Prevention.

Never allow big weeds or rankly growing grasses to stand between cane rows, as these noctuid moths usually deposit their eggs in such situations. Keep all headlands clean; and in the event of grass land occurring outside boundary fences watch such growth for the appearance of caterpillars, which if present (but too small to attract attention) may, later on, invade the adjoining cane land. Waste grass country of this sort should be burnt over during Spring and Autumn months, as such practice coupled with clean cultivation of the cane will go a long way towards preventing a recurrence of "army" or "grass" caterpillars.

### Arsenical Sprays.

Unfortunately, many of the outbreaks of "army worm" are not reported until most of the damage has been effected, and it is too late to save much of the crop. In such cases the best plan of procedure is to endeavour to prevent further spread of the caterpillars into undamaged portions of the field. To this end a strip of undamaged cane a few yards wide, and situated just in front of the advancing caterpillars should be sprayed with an arsenical solution to form a poisoned barrier.

In field practice we have found lead arsenate to be the cheapest and best spray to use, applied in the proportion of 2 lb. lead arsenate to 50 gallons of water. In America this arsenical—when used against "army worms"—was proved to be much superior to Paris green, and in every way more effective, the strength employed being 2 to 3 lb. lead arsenate in 50 gallons of water. The above proportion, however, applies practically to all caterpillars and cutworms devouring such crops as potatoes, tomatoes, &c. Home-made arsenate of lead can be made as follows:—Acetate of lead 22 oz., arsenate of soda 8 oz., water 50 gallons; dissolve the sugar of lead in 2 gallons of water in a wooden vessel; in another pail dissolve the arsenate of soda in about 1 gallon of water. Pour these two solutions together, and add sufficient water to make 50 gallons of spray material.

Care must be taken when using lead arsenate solution to keep it well stirred, in order to prevent the arsenic from settling, and so insure a uniform distribution of the poison.

### A MINOR SUGARCANE PEST (*Plutorectis melanodes* M. and L.)

Mr. R. W. Mungomery, Assistant Entomologist at Bundaberg, has submitted the following report for the period August to September, 1928, to the Director of the Bureau of Sugar Experiment Stations, Mr. H. T. Easterby:—

During this period of the year it is not an uncommon sight to see hanging from the cane foliage, a tough felt-like case, and on the outer surface of this case are interwoven small pieces of dead sticks or cane trash. In addition, the foliage nearby may have conspicuous irregular gaps in it, similar to that caused

by grasshopper injury. This, really, is the result of the cane leaves having been eaten by a caterpillar which lives inside the case, and if the observer is possessed of sufficient patience, he will be rewarded by seeing the caterpillar project its head out from the top of the case for a distance of half an inch or more and commence gnawing away the leaf tissues or else moving from one spot to another. If the caterpillar be disturbed when thus occupied, it will suddenly withdraw its head and remain with the mouth of the case securely fastened until the would-be intruder has abandoned its attack. While the caterpillar is engaged in feeding or in crawling from leaf to leaf it always carries its case with it, and when it is on the point of moulting or pupating the top of the case is closed up, and it suspends itself by means of silken threads from some part of the cane plant, or from any other object near at hand. From this peculiar habit which the larva has of living within the case, this type of larva has earned for itself the name of "bag-worm." Less commonly it is sometimes referred to as a "basket-worm." Similar insects are frequently seen on rose bushes, fruit trees, and many of our native forest trees, and they all have much the same habits.

The species found damaging cane has been reared through to the adult stage, and has been identified by Dr. Jofferis Turner as *Plutorectis melanodes* M. and L., belonging to the family *Psychidae*. This family of moths is of more than passing interest on account of the great difference of form exhibited between the male and female sexes. The male moth *P. melanodes* is a rather densely haired, buff-coloured insect, with feathery antennæ and wings of a dark smoky colour becoming lighter towards the tips. As soon as it has assumed the adult form, it escapes from the case which has protected it during its larval stage and flies away. The female, on the other hand, is incapable of flight and never leaves the case. In form it reverts more to the original larva and becomes quite maggot-like; in fact, it is totally unlike a moth in general appearance, and its whole body appears to be nothing less than a huge sac of eggs, and its one function is to perpetuate the species.

This insect must be classed as only a minor sugar-cane pest, and, therefore, is not looked on with any great disfavour by the average grower. In the first place these caterpillars are very slow feeders, eating a little at a time and sometimes refusing to eat for several days during the period prior to moulting, so that the ordinary growth of cane leaves more than counterbalances the small injury they inflict. They also require a much longer time to complete their life-cycle than the common Noctuid caterpillars which attack cane, and since they remain on the tall cane and assume the imaginal stage during the spring and summer months, most of them are destroyed when burning the trash previous to harvesting the crop, or by firing the trash after harvesting has been completed. Furthermore, although they live inside a case and are, for this reason, not so likely to be attacked by birds, &c., other insects such as Tachinid flies parasitise them, and probably other factors also operate unfavourably against them and serve to help keep them in check, and they have never become of sufficient consequence to warrant control measures being instituted against them.

## ENTOMOLOGIST'S ADVICE TO CANEGROWERS.

By EDMUND JARVIS.

### Commencement of Monthly Hints.

The publication of this series of Entomological Notes was first started nearly five years ago (November, 1923) for the purpose of reminding our growers of their responsibilities with regard to the control of the various cane insects likely to be in evidence each month.

Concerted action undertaken at the right time might go far towards minimising the injuries caused by some of the more serious cane pests, and whilst not unduly trespassing on the daily work of the farm, would also benefit farmers financially.

The forms of control advocated in these Monthly Hints apply to those species of decided economic importance, occurring more or less commonly throughout the cane-fields of North Queensland.

### Price of Paradichlorobenzene.

At the present time this grub fumigant can be procured for £2 15s. per cwt. (98 per cent. purity); the minimum quantity supplied at this price being in 2-ton lots, delivered at main Queensland ports.

Growers wishing to obtain supplies for the coming season should lose no time in communicating with the secretary of the Cairns Cane Growers' Association, Theatre Buildings, Cairns.

### An Easy Way to Apply Paradichlorobenzene.

Cane grubs have been successfully fumigated with this chemical by means of a simple form of fertilising machine, in which it can be applied either alone or mixed with manure.

Very good results were obtained in this way last February on a couple of 2-acre plots of B 147, one of which was treated with crude paradichlorobenzene alone at the rate of 150 lb. per acre, and the other with about 75 lb. of this fumigant thoroughly mixed with an equal weight of manure.

The cane at the time of treatment was about 5 feet high, and the paradichlor. before being used was passed through a coarse sieve with  $\frac{1}{4}$ -inch meshes.

Any cane farmers interested in this matter should write to the Entomologist at Meringa (Private Bag, Cairns); or call at the Sugar Experiment Station, which is one of the rail motor stops on the Cairns to Aloomba branch.

### Invasion of Canefields by "Army Worms."

During the present season several outbreaks of this so-called "caterpillar plague" have been reported from widely separated localities. The species of moth responsible for such trouble—viz., *Cirphis unipuncta* Haw.—has often been described in previous Monthly Hints and Reports (see Bulletin No. 3, second edition, revised, pp. 35 to 39, Div. of Ent. of Bureau of Sug. Expt. Stats., 1927). An outbreak of this pest is seldom likely to prove serious unless the caterpillars should chance to be very numerous and about half an inch long, and are found attacking young shoots of ratoon and plant cane. In such cases the best poison spray to use is lead arsenate—2 lb. in about 50 gallons of water.

For fuller information the reader should refer to the writer's report for the period of August to September, 1928, which will be found in the October numbers of the "Queensland Agricultural Journal" and the "Australian Sugar Journal."

## FIELD REPORTS.

The Southern Field Officer, Mr. J. C. Murray, reports for the period from 14th August to 14th September:—

### BUNDABERG.

#### Weather and Crops.

Conditions generally are good, the crushing going along smoothly with a satisfactory output of sugar. Rain is looked for at present, the spring planting requiring about an inch to give it a good start. The weed growth should not be hard to deal with this spring. Noxious grasses and weed pests are all very dry, and chipping, combined with the scorching that trash fires will give, should make the farmers' tasks easier than last year, with its long crushing season and heavy rains.

It is estimated that 30 per cent. of the Bundaberg cane is arrowing. In some fields advance maturity is in evidence, with the arrows falling away and the top eyes shooting. This inability to maintain its erect arrowed condition for any length of time may be assisted by the gumming disease that is present. The c.c.s. of the cane in the district is high at present, but with the deterioration that follows early arrowing there is a probability of the high sugar content not being maintained throughout the season.

The big question of fertilisation calls for more attention in the Bundaberg district. With this matter is connected much of scientific investigation, but all that can be done in this way will fall to the ground without the co-operation of those most concerned—the growers. The virgin soil has been used up and we must supply humus, potash, nitrogen, and phosphoric acid in carefully considered quantities, and the way to obtain an intelligent idea of these quantities is for the grower of cane to experiment himself and not rely absolutely on the efficacy of the best advertised trade mixture.

Regarding the sub-areas in the Bundaberg district, conditions could be briefly described as under:—

### Woongarra.

*Plant Cane.*—Made good growth, cutting expected tonnage, and satisfactory c.e.s.

*Ratoons.*—Not altogether satisfactory tonnage, but c.e.s. is good.

*Standover.*—In fair condition; satisfactory c.e.s.

*Spring Planting.*—Ground dry; coming up slowly.

*Autumn Planting.*—Has made slow growth up to date. A considerable amount of supplying had to be done. Wants rain.

*Soil Conditions.*—Farms well worked, although subsoil is very hard. Grubbing would improve.

*Varieties.*—N.G. 16, N.G. 15, H.Q. 285, D. 1135, M. 1900, Black Innes, H.Q. 77, Q. 813, Q. 855, and Malagache. There are a number of others on the farms, but the above are principally grown. N.G. 15 (Badila) second ratoons must be taken out this season, otherwise it will degenerate into gumming diseased rubbish. The farmers and planters are asked to give this their attention.

### Oakwood.

*Plant Cane.*—Good growth and tonnage, especially in case of Q. 813; c.e.s. good.

*Ratoons.*—Tonnage not high; c.e.s. good.

*Standover.*—In fair condition.

*Young Plant Cane.*—Growing and striking well. Requires rain.

*Soil Conditions.*—The soil here is a light red scrub and forest loam. Drains and cultivates well. Would be improved if the growers could go deeper into the substrata.

*Varieties.*—Q. 813, Q. 812A, E.K. 2, E.K. 28, M. 1900 Seedling, H.Q. 285, and D. 1135. There are other varieties, but the above are principally grown.

### Clayton.

*Plant Cane.*—Good growth. The tonnage and c.e.s. are satisfactory to the farmers.

*Ratoons.*—Tonnage not heavy, but c.e.s. high.

*Standover.*—This is in very good condition and should give satisfactory results.

*Young Plant Cane.*—This is growing well, but wants rain.

*Varieties.*—D. 1135, Q. 813, H.Q. 285, M. 1900 Seedling, and H.Q. 77. This is a fairly clean area, and would be reasonably safe for plants.

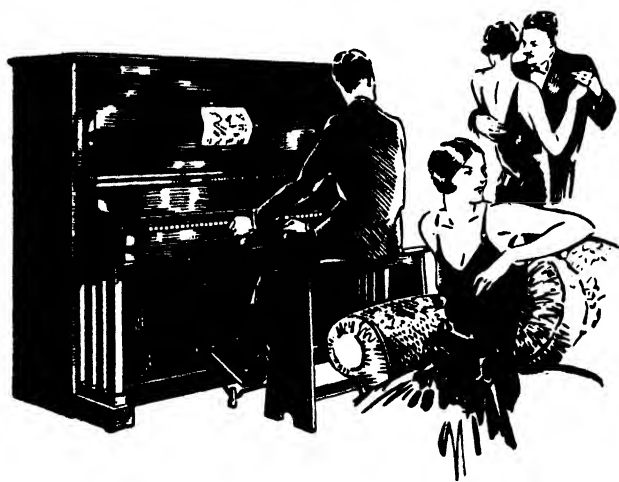
### Bullyard.

The farmers here have a good showing of cane. The soil is, for the greater part, a light red forest loam, easy to work in that it is very level and accessible to cultivation. Cane varieties include Black Innes, M. 1900 Seedling, Malagache, H.Q. 285, H. 109, M. 89, H. 227, D. 1135, 7 R. 428, and Q. 813.

Growers are recommended to plant more Q. 813. In regard to this variety they are advised to avoid (a) cutting too early, (b) planting too shallow, and (c) carefully refrain from injuring the stools when ratooning.

Gumming disease is present in this area, therefore it is necessary for the growers prior to planting to carefully watch their plants and throw away any that show gum on the cut surface.

If you like the "Journal," kindly bring it under the notice of your neighbours who are not already subscribers. To farmers it is free and the annual charge of one shilling is merely to cover postage for the twelve months.



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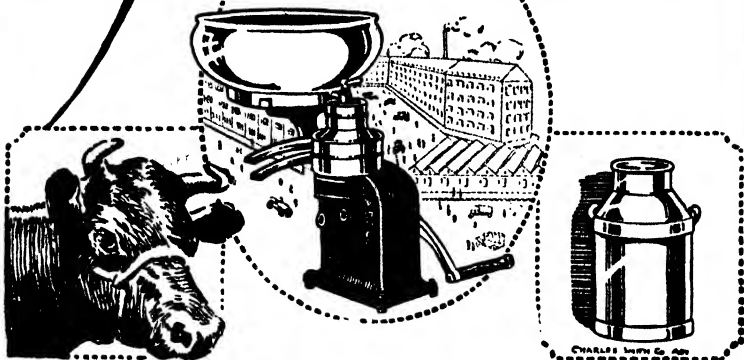
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## RECORDS OF AUSTRALIAN THYSANOPTERA (THRIPS).

By A. A. GIRAULT, B.Sc., Entomological Branch.

### PART IV.

This is a continuation of the parts published in this Journal May and October, 1927, and June, 1928. The same arrangements have been followed. I am further indebted to Mr. C. T. White, the Government Botanist, as formerly, and also to the Queensland Museum for aid in reference to literature.

1. *Thrips tabaci* Lindeman.—From flowers, *Mesembryanthemum* again, Cheltenham, Victoria, May, 1928, F. E. Wilson, and at Hawthorn, Victoria, 11th December, 1927, R. Kelly; carnation, Glen Osmond, South Australia, 8th June, 1928, J. G. Bald (Waite Agricultural Research Institute); common in Shasta Daisy, Box Hill, Victoria, 27th January, 1928, R. Kelly; Azalea and *Beaumontia grandiflora*, Botanic Gardens, Brisbane, June, 1928, G. H. Hardy; on cabbage leaves in numbers, Cleveland, 27th June, 1928, J. A. Weddell; on onion, Glen Osmond, South Australia, 8th June, 1928, J. G. Bald (Waite Agricultural Research Institute).

Numerous specimens submitted of the latter were a distinct variety of a dark brown-black colour, contrasting with a few of the lighter coloured and typical specimens also present. There were no structural differences. These dark forms are no doubt the variety *pullus* Uzel already recorded from Australia by Bagnall.

This species proves so far to be the commonest and most widespread of the terebrant Thysanoptera. It more than holds its own, and occurs more frequently in material examined than any other species. As the material which passes through my hands is chance or random in its nature, the frequency of the occurrence of this species in it would seem to represent truly its real occurrence outside.

2. *Thrips imaginis* Bagnall.—Shasta Daisy, Box Hill, Victoria, 27th January, 1928, R. Kelly; by the same collector, on water weed, Wattle Park, Victoria, 29th December, 1927; flowers of *Mesembryanthemum* with *tabaci*, Hawthorn, Victoria, 11th December, 1927, R. Kelly.

3. *Pseudanophothrips achatius* Bagnall.—I have examined the cotype of this species (Mount Lofty, Adelaide, South Adelaide) through the kindness of Mr. R. Kelly of Melbourne and confirm the previous identifications. From plum blossoms, Stanthorpe, 3rd September, 1928, S. M. Watson.

4. *Physothrips Kellyanus* Bagnall.—Carnation, casual in a large population of No. 74, Glen Osmond, South Australia, 8th June, 1928, J. G. Bald (Waite Agricultural Research Institute); passion vine, Taringa, 26th August, 1928; plum, Stanthorpe, 3rd September, 1928, S. M. Watson.

6. *Physothrips brevicornis* Bagnall.—On *Mesembryanthemum*, Cheltenham, Victoria, May, 1928, F. Erasmus Wilson; by R. Kelly—*Hypochaeris radicata* again, Hawthorn (27th November, 1927, 22nd January, and in March, 1928) and Wattle Park (29th December,

1927), Victoria; Shasta Daisy, Box Hill, Victoria, 27th January, 1928; *Ranunculus hippaceus*, Healesville, Victoria, 9th October, 1927; on *Eucalyptus sideroxylon*, Bendigo, Victoria, 1st July, 1928, F. Erasmus Wilson—rare amongst numerous specimens of No. 8.

7. *Thrips lacteicarpus* Girault.—Plum, Stanthorpe, 3rd September, 1928, S. M. Watson.

8. *Isononeurothrips australis* Bagnall.—*Hypochaeris radicata*, Lorne, Victoria, 14th January, 1928, R. Kelly; *Eucalyptus sideroxylon*, and rarely upon dead gum leaves, Bendigo, Victoria, 1st July, 1928, F. Erasmus Wilson; apricot (very abundant), Stanthorpe, 28th August, 1928, H. Jarvis (through Chief Entomologist).

This is a richly coloured species, the abdomen usually white, black above except marginally. The only male I have seen is much smaller, white as in *Thrips lacteicarpus*, the apex of the abdomen with a pair of elongate bristles directed caudad. It was with the Bendigo, Victoria, material recorded just above.

9. *Idolothrips marginatus* Haliday.—Many pairs from grass tussocks, Ringwood, Victoria, May, 1928, F. Erasmus Wilson; from dead gum leaves, all females, Bendigo, Victoria, 1st July, 1928, same collector.

11. *Desmothrips bagnalli* Karny.—Forest, Stanthorpe, 24th December, 1923, a female.

12. *Desmothrips tenuicornis* Bagnall.—This is the wrong name for this number. The species *propinquus* of Bagnall is correct. The species *tenuicornis*, I conclude from further study, is *australis*, which see (No. 56). The three species are very closely allied.

The third antennal segment may be entirely white.

13. This is *Pseudothrips* (*Glaucothrips*) *parvus* Bagnall which is a *Physothrips*. The name is *Physothrips parvus* (Bagnall). I have examined a cotype of *parvus* from Brandon, Queensland, 16th October, 1914. through Mr. R. Kelly of Melbourne.

19. *Chirtothrips* ought to be *Chirothrips*.

21. *Heliothrips hamorrhoidalis* Bouché.—Many females from *Adiantum peruvianum*, Botanic Gardens, Brisbane, June, 1928, H. Tryon.

The species farther differs from *semiaureus* in having the projected part of anterior head with concave or scolloped sides instead of straight sides.

25. This is *Cryptothrips froudei* Girault and not *rhopaloides* Karny.

The head is one-third longer than wide. the postocular bristle is present (thought to be absent) and far down the side of the head, moderately long, exceeding the postlateral and about equal the anterolateral; the club is armed with many stout, elongate setae along one side. Sense cones on antennals 3-4 more than two, some dorsal. The unusual position of the postocular is noteworthy, and was the cause of its being overlooked.

A male, Kingston, forest; and a female, Mount Larcom, 3rd February, 1924.

27. *Horistothrips xanthocnemis* Karny.—A male, forest, Taringa, 7th May, 1928.

35. *Thrips shakespearei* Girault.—See No. 77.

38. *Heliothrips bifasciipennis* Girault.—A female on under leaf surface of granadilla, Taringa, 19th August, 1928. Originally described from specimens which were injuring the fruit of the passion vine. In what is perhaps a teneral specimen (female) caught from a leaf of passion vine, Taringa, 26th August, 1928, the whole body was golden yellow margined with black from eye to apex penultimate abdominal segment. At first I did not recognise this specimen, so strikingly coloured was it.

39. *Plesiothrips perplexus* Beach.—A female, window, City of Brisbane (Department of Agriculture), 12th October, 1925, I. W. Helmsing.

The genus has so far been misplaced and belongs to the Chirothripinae with *Limothrips*. Like the latter its sole species is a grain inhabiting one.

41. *Anaphothrips Keatsi* Girault.—From *Heterothrips* together with *A. dubius*.

42. The specific name is *clavipilus* not *clavispilus*.

44. *Haplothrips partifuscipennis* Girault is a naked name and has no standing in nomenclature. The species is *bituberculatus* Girault described in *Podothrips*, but since the characteristic of *Podothrips* does not pertain to this species which only bears two variable tubercles on the lower part of distal tibia (absent in the original specimen), I refer the species back to *Haplothrips*. The species is evidently a scavenger or a predator, and was described from the banana where it occurs rarely amongst the colonies of *Scirtothrips signipennis*. It is the black species with a red larva found at Gympie as the third species occurring on the banana plant. (See Bulletin No. 2, Division of Entomology and Plant Pathology, Department of Agriculture and Stock, Brisbane, June, 1925, page 10.) I have the following additional records:—

Taringa, forest, 7th May, 1928; crawling amongst Pink Wax scales (*Ceroplastes rubens*) on citrus, Gayndah, March, 1928; in Casuarina forest, Morningside, 23rd August, 1925.

47. *Haplothrips froggatti* Hood.—Occasional in plum blossoms, Stanthorpe, 3rd September, 1928, S. M. Watson.

51. *Haplothrips gowdeyi* Franklin.—On Azalea and Justicea, Botanic Gardens, Brisbane, G. H. Hardy; on *Cyperus alternifolius*, Mayne Junction, 5th May, 1928, A. R. Brimblecombe.

53. *Thrips fortis* Bagnall.—Two females collected by R. Kelly in flowers of *Cassinia aculeata*, South Australia, and also bearing the label *Thrips florum* Schmutz which does not occur in Australia. The identification is by Guy D. Morison of the British Museum. This identification agrees with my own, but as I pointed out previously there are 4-5 pairs of *strong* hind pronotal setae all dark and increasing in size mesad. Differs from *lactecornis*: Ocelli pallid, without pigmented crescents and distinctly more separated, lateral distant from median; antennals 4-7 all dark, the wings are dusky and the interocellar setae are behind and away from median ocellus instead of being contiguous at sides. The species *seminiveus* aside from colour differs from *fortis* in lacking the cross-row of setae on middle of sternites.

54. *Haplothrips nigroculex* Girault.—Shasta Daisy, Box Hill, Victoria, 27th January, 1928; and on *Acacia calamifolia*, Winiam, North-west Victoria, September, 1927. Both collected by R. Kelly.

In these specimens the postocular was a bit closer to the cheek than to the eye.

56. *Desmothrips australis* Bagnall.

*Desmothrips tenuicornis* Bagnall.

Antennal 3 may be all white and the species as is not very usual, vary considerably; this is so much the case that I consider the sole characteristic of *propinquus* to be the 8-jointed maxillary palpi. In both species the labial palpi vary from 3-4 joints and very likely the maxillary palpi are unstable. As the labial palpi vary, the genus is *Orothrips* which takes precedence.

Mr. R. Kelly, of Melbourne, has sent me the following specimens:—An apterous female on *Goodenia*, Clare, South Australia, 14th October, 1926; a female from *Acacia pycnantha*, Winiam, Victoria, September, 1927.

Antennals 3 and 4 vary in relative length.

Also the following material of a well marked variety (named *poultoni* by Kelly and as yet manuscript name only).

On *Antirrhinum*, Box Hill, Victoria, 26th February, 1928.

A male, Stock, Renmark, South Australia; roses, Box Hill, Victoria, 3rd November, 1927 (in this specimen antennals 3-4 were shorter than usual and equal, 3 dark at apex; a female); at the same place upon *Oenothera* and *Allyeum*, 24th and 26th February, 1928; *Prunus japonicus*, Box Hill, Victoria, 9th March, 1928.

62. *Thrips partirufus* Girault.—In the preceding records from bananas, unless specifically stated, the insect was on the stem or fruit. Differs markedly from *japonicus* (cotype) in colour of antennæ and abdomen. Occurs also in Sumatra and Fiji.

63. The reference in Part III. is to the stem and not to the flowers of the banana.

66. *Chirothrips atricorpus* Girault.—Taringa, forest, 25th April and 27th May, 1928.

67. *Adiaphorothrips shakespearella* Girault.—A female, Wowan, brigalow forest, 12th April, 1923.

68. *Cryptothrips tithonus* Girault.—Two females from galls, Fern Tree Gully, Victoria, March, 1918, G. H. Hardy.

69. *Heliothrips sculptilis* Hood.—A female sweeping grass in a weedy garden, Norman Park, 10th September, 1927. Originally described from Proserpine, North Queensland, and known but from the two places.

70. *Elaphrothrips apterus* Girault.—Five specimens taken from tussocks at Melton, Victoria, May, 1928, F. Erasmus Wilson.

This record extends the known range of this species from South Queensland to Victoria.

71. *Limothrips cerealium* Haliday.—A female in tussocks, Melton, Victoria, May, 1928, F. Erasmus Wilson.

Mr. R. Kelly first collected this European species in Australia and he has sent me what appears to be part of the original material, a pair taken from wheat at Sydenham, Victoria, 25th November, 1915. I have thus confirmed the identification which was made by Bagnall.

72. *Titanothrips portentosus* Karny.—This appears to be a species of *Adiaphorothrips*.

73. *Heliothrips quadrifasciatus* (Girault).—From *Sericothrips* which has not been discovered in Australia so far. Very close to No. 69 but the bands on the fore wing are different and here the distal 2 very stout, dark bristles on vein 2 are not equal but the proximal is distinctly weaker. No. 69 shows indications of having the long middle dark band divided in the only specimen I have seen.

74. *Parafrankliniella nigripes* Girault.—From carnation flowers, Glen Osmond, South Australia, 8th June, 1928, J. G. Bald and Geoff. Samuel (Waite Agricultural Research Institute); many specimens and larvæ.

The latter, when mature, are of an orange colour and the bristles of side and dorsal abdomen and of prothorax are elongate and capitate, those from apex of abdomen (4) elongate, curved and acute; legs, antennæ pale; from each of the last two segments of the composite fourth antennal on alternate sides, is a thorn-like sense cone.

The first stage pupa is also orange in colour, the antennæ filiform and dark, 3-5 long, equal; bristles as in the larva but the caudal margin of the penultimate segment of the abdomen bears four, stout, thorn-like setæ. The exterior angle of the mesothorax bears three elongate, capitate bristles set in a triangle of which the apical and cephalic bristle is distinctly shorter than the others.

The antennæ of the larvæ are often dusky.

The male is similar to the female (adults) but the abdomen bears three pairs of very stout, long apical bristles and is darker.

75. *Euoplothrips bagnalli* Hood.—Two macromerous females taken from galls on leaves of a jungle vine (*Piper* sp.), Gadgarra, June, 1928 (J. R. Dawson, through the Chief Entomologist). Segments 3 and 4 of the antenna nearly all yellow in these specimens, each slightly dusky at apex; basal  $\frac{1}{2}$  of 5 yellow. The femoral tooth is yellow. On the fore tibia at ventral apex there is a triangular tooth as in the *Kladothripinæ*.

A micromerous male from galls on *Smilax australis*, Cooroy, 11th July, 1928, W. A. T. Summerville, amongst a very large number of a species of *Cryptothrips* (as yet not identified). The two teeth of ventral fore tibia are closer together in this form, and the first not at middle but beyond middle.

76. *Cryptothrips milmani* Girault.—Two specimens, both jet and the second and third tarsi jet, forest, Taringa, May, 1928.

77. *Thrips aligherini* Girault.—See No. 35. The previous notes under that number in Parts I. and II. refer to this species excepting the first assertion in Part I.

78. *Trichothrips erinaceus* Karny.—This is a striking species in shape and my specimens have deeply infuscated wings. I would call the species a *Phloeothrips*. The following specimens:—Two females,

forest, Wynnum; another at Morningside, Casuarina forest, 23rd August, 1925.

Karny (*in litt*) has informed me that the wings of this species are "endarkened uniformly on the whole surface"; the colour of the wings is not given in the original description, and at first I was somewhat in doubt as to the above specimens.

79. *Phoxothrips giganteus* Girault.—Two females, type locality (Amamoor, jungle, 13th July, 1924). This sex has no armature whatsoever even on the fore tarsi and the fore femur is only slightly swollen. It is like the male in colour.

### RAINFALL IN THE AGRICULTURAL DISTRICTS.

TABLE SHOWING THE AVERAGE RAINFALL FOR THE MONTH OF AUGUST, 1928, IN THE AGRICULTURAL DISTRICTS, TOGETHER WITH TOTAL RAINFALL DURING AUGUST, 1928 AND 1927, FOR COMPARISON.

Divisions and Stations.	AVERAGE RAINFALL.		TOTAL RAINFALL.		Divisions and Stations.	AVERAGE RAINFALL.		TOTAL RAINFALL.	
	Aug.	No. of Years' Records.	Aug., 1928.	Aug., 1927.		Aug.	No. of Years' Records.	Aug., 1928.	Aug., 1927.
<i>North Coast.</i>					<i>South Coast—continued:</i>				
Atherton ...	0·83	27	1·08	0·12	Nambour ...	1·91	32	1·05	0·07
Cairns ...	1·76	46	0·59	0·15	Nanango ...	1·39	46	0	0·20
Cardwell ...	1·30	56	0·98	0·03	Rockhampton ...	1·00	41	0·05	0·72
Cooktown ...	1·32	52	0·02	0·35	Woodford ...	1·77	41	0·73	0·32
Herberton ...	0·66	41	0·12	0·07	<i>Darling Downs.</i>				
Ingham ...	1·53	36	0·67	0·23	Dalby ...	1·25	58	0	0·65
Innisfail ...	5·13	47	3·78	0·19	Emu Vale ...	1·21	32	0·21	0·19
Mossman ...	1·36	15	0·14	0·10	Jimbour ...	1·24	40	0	0·15
Townsville ...	0·54	57	0	0	Miles ...	1·17	43	0	0·20
<i>Central Coast.</i>					Stanthorpe ...	1·85	55	0·37	0·33
Ayr ...	0·62	41	0	0	Toowoomba ...	1·72	56	0·90	0·45
Bowen ...	0·68	57	0	0	Warwick ...	1·55	68	0·23	0·19
Charters Towers ...	0·60	46	0	0	<i>Maranoa.</i>				
Mackay ...	1·09	57	0·17	0·45	Roma ...	0·99	54	0	0·12
Proserpine ...	1·42	25	0·70	0·05	<i>State Farms, &amp;c.</i>				
St. Lawrence ...	0·88	57	0·12	0·12	Bungeworgorai ...	0·96	14	0	0·18
<i>South Coast.</i>					Gatton College ...	1·21	29	0·63	0·28
Biggenden ...	1·10	29	0·35	0·53	Gindie ...	0·74	29	0	0·07
Bundaberg ...	1·32	45	0·25	1·22	Hermistage ...	1·37	22	0·35	0·22
Brisbane ...	2·06	77	1·05	0·27	Kairi ...	0·94	14	1·11	0
Caboolture ...	0·57	41	0·98	0·20	Sugar Experiment Station, Mackay	0·98	31	0·5	0·18
Childers ...	1·25	33	0·28	1·04	Warren ...	0·91	14	...	0·81
Crohamhurst ...	2·24	35	1·07	0·15					
Esk ...	1·56	41	0·70	0·30					
Gayndah ...	1·20	57	0	0·60					
Gympie ...	1·78	58	0·49	1·42					
Kilkivan ...	1·47	49	0·30	0·23					
Maryborough ...	1·70	56	0·42	0·86					

GEORGE G. BOND,

Divisional Meteorologist.

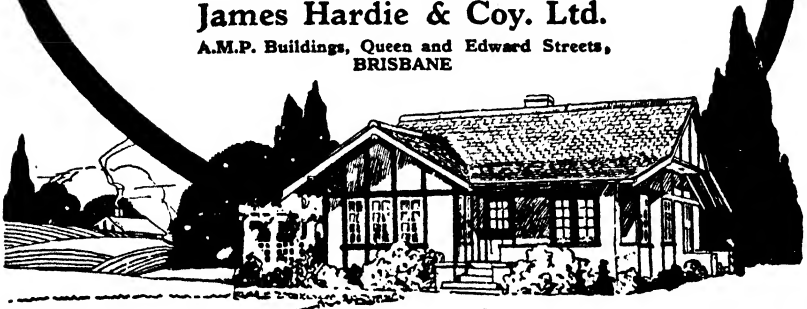
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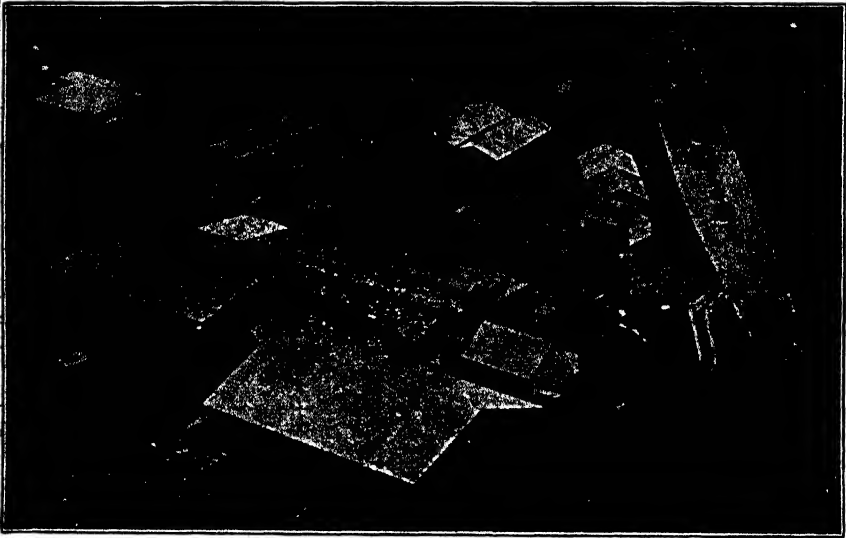
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## PROGRESS OF AGRICULTURE IN QUEENSLAND.

By J. F. F. REID, Editor of Publications, Department of Agriculture and Stock.\*

**Geographically, Queensland is in a position to supply economically the wants of the eastern mainland of Asia and the Pacific Islands. Coming to the personal equation, Queensland has always attracted the adventurous, and the strong and practical character of her pioneers is expressed in the development we see to-day—the evidence of a progress that constitutes one of the greatest epics in the history of British colonisation.**

In previous talks we have discussed in a very general way the progress of agriculture in other countries. Therefore, I think that it would be quite fitting to take a general survey of the primary industries in Queensland and consider what we have done ourselves in the way of developing agriculture.

### The Land of the Young Man.

Of all the practically undeveloped countries in the world to-day, Queensland, with its illimitable reservoir of latent wealth, is the land of the young man—the land of the future.

In climate we are particularly well blessed. Every known economic plant, requiring either temperate or torrid conditions, can be produced prolifically within our borders. The whole range of climate of the State embraces the winter snows on the southern uplands, the dry atmosphere of the western plains, and the summer humidity of our northern tropical areas.

No other country can claim the possession of richer pastoral, agricultural, and mineral resources. Ours is a vast country in a corner of which the British Isles would be lost. It is hard for many people to realise, for instance, that here in Brisbane we are actually nearer Melbourne than we are to Cooktown or Camooweal, and north of both centres we could go many miles further, particularly north of Cooktown up through the Cape York Peninsula, which to a vast majority of us is still an unknown land. And yet, the total population of the whole immense State is considerably less than that of the single city of Melbourne, and very much less than that of the city of Sydney.

In all the world to-day there is no country offering greater opportunity to the skill, will, and character of men. A wise and far-sighted railway policy has made impossible the folly of centralisation; natural ports have been made the outlet for the primary products of, in every instance, provinces as large as the State of Victoria. Each coastal city has its own railway system, and so well is the State endowed that behind each port are vast, undeveloped, or partly worked, coal measures which may be regarded as gilt-edged guarantees of a great industrial future.

### An Epic of Colonisation.

Geographically, Queensland is in a position to supply economically the wants of the eastern mainland of Asia and the Pacific Islands. Coming to the personal equation, Queensland has always attracted the adventurous, and the strong character of her pioneers is expressed in the development we see to-day—the evidence of a progress that constitutes one of the greatest epics in the history of British colonisation.

It was not until the early forties of last century that land settlement began to take definite shape. Pastoral occupations followed closely on discovery. The wealth of the Darling Downs, discovered by Allan Cunningham just a hundred years ago, attracted southern stockmen, and in the years that came after the drover followed the pathfinder, northward to natural cattle country, and westward the great open rolling Downs—our Mitchell grass country that to-day produces a nation's wealth in wool. Stock raising became the new colony's first great industry. In

\* In an address delivered through the Queensland Government Radio Station, 4QG.

the first few years of settlement development proceeded rapidly. Rich virgin soils did not remain long untilled. Maize, sugar, and cotton were cultivated, but the pioneer's main interest was still centred in his flocks and herds.

The Darling Downs, a wonderful stretch of country comprising 16,000,000 acres, of which 4,000,000 are considered to be the most fertile black soil area in the world—Sir John Russell, the great English soil scientist, of the Rothamsted Institute, when in Queensland recently, was deeply impressed with its richness—was, however, soon to feel the tickle of the plough-share.

In 1840, Patrick Leslie formed the first Queensland stock station at Toolburra; and Warwick, the flourishing wheat land centre, and one of the important inland towns of Australia, now stands on the site of that pioneer pastoral settlement.



PLATE 83.—MR. J. F. F. REID.

### **The Romance of the Wool Industry.**

The romance of the wool industry is known to and appreciated by most of us, but it is interesting, sometimes, to look back along the road we have come and over the country we have traversed.

The early settlers soon found out that the lands on the sunset side of the main range were adapted to the growth of the finest merino wool—wool that, in successful competition with all other producing countries, has since, at times, reached the top price in the world's salerooms. In the early days of the industry merinos were the main stocks, but in 1869 an experimental cross was made with Leicesters. Its success was so decisive that cross-breeding became fairly general. Lincolns, Romney Marshes, Border Leicesters, Cotswolds, Shropshires, and South Downs were all tried, but the Lincoln-Merino cross was favoured more generally. With a ready wool market sheep country was quickly occupied. Settlement spread westwards and northwards to the far interior where, to-day, is grown probably the finest Merino wool in the world.

Artesian and sub-artesian wells solved to a large extent the water problems, and experience has shown us that Queensland is one of the healthiest countries for stock on the globe. Our western areas are singularly free from disease. Favourable conditions, combined with intelligent animal husbandry and scientific methods, go to make the base on which has been built Queensland's proud reputation of producing wool qualities as high—in some years higher—than those of any other State in the Commonwealth. Queensland scoured Merino has brought within a fraction of 64d. at the Brisbane sales.

### **The Development of the Beef Industry.**

Then there is the beef industry that developed from equally small beginnings, though its governing conditions have often been less stable. At the time of Separation in 1859, the Durham and Shorthorn were the only breeds represented on Queensland pastures. Since then, by systematic breeding with stock from the great cattle families of the old country, herds have been much improved, and other breeds, including Herefords and Polled Angus, have been introduced and now form a large proportion of our cattle population.

In the eighties the point of over-production was reached. The surplus went into the tallow casks at the boiling-down works. This wasteful process was superseded by freezing, and meatworks as we know them to-day were established at convenient ports and our frozen meat trade was born.

By a system of regulated purchase, treatment, and shipping, the industry was stabilised. More freezers were established, and an era of prosperity followed. Being subject, of course, to seasonal conditions, the fortunes of the industry varied. During the war the industry passed through its most prosperous period, but with the completion of Imperial contracts and the operation of certain economic and other causes, a slump set in. By herd improvement, scientific treatment of the product, regulated distribution, the regaining of old and opening of new markets, and a thorough system of organisation generally, a strong revival in the industry is anticipated. The high quality of Queensland beef has long been recognised in the world's markets. All this has nothing much to do with agriculture, you might say, but in the expansion of each industry in Queensland—the farming and the pastoral—conditions were very much the same; and with us, I think, they must always remain inter-related.

### **Agriculture.**

Coming now to agriculture particularly. In the early sixties cultivation was confined to the coast. Maize and other crops were grown on what is now the thickly-populated suburbs of Oxley, Bulimba, and Hawthorne, and in other near-city parts of the Greater Brisbane area. The Downs country was, as yet, practically a thinly peopled sheep walk. The total furrowed area within the State amounted at the most to less than 3,500 acres. Sugar, cotton, and wheat growing had not even emerged from the phantasy of a dream. On inward manifests, agricultural products were major entries. Our butter came from far-away Ireland, and most other products had to be imported also. Bananas were introduced and grown along the river banks.

Generally the Government of the day was not interested in the farmer, and the returns he got from his land would scarcely keep a ghost in fresh air. It was found convenient to sell him land at £1 an acre; that is, land that was looked upon as useless for sheep. The farmer came to be regarded as a necessary evil. Legislation was directed to the expansion of the pastoral industry, and agriculture was neglected. To the farmer was handed the meatless bone. Then came the American Civil War, and a consequent call for cotton to keep the wheels of Lancashire mills revolving. Queensland dreamt of cotton fields and cotton kings. A collapse followed. Farmers turned their attention to sugar, and Louis Hope grew the first crop on the red lands down at Cleveland.

From that small beginning grew the great sugar industry as we know it to-day—one of Australia's great land settling agencies with an annual value in hard cash of very many millions sterling.

### **The White Man's Industry in a White Man's Land.**

Queensland is the one country in the world to-day that grows sugar-cane successfully, and manufactures sugar by white labour and under white labour conditions. The industry pays £6,000,000 a year to white Australian workers; it is an important and most valuable factor in other industries employing an army of white Australians. More than 100,000 persons are dependent upon it, and it employs at least 20,000 people. The industry has an even greater national significance. When we think of

national defence a northern sugar-mill is as good as a brigade of infantry permanently garrisoned. The first Australian contingent despatched on overseas service in the great war went from northern cane districts, and through its agency the White Australia doctrine has advanced from an ideal to an actuality. In the maintenance of that actuality the defence of the Commonwealth is bound up with the preservation and progress of the Queensland sugar industry.

In 1871 there were only 9,581 acres under sugar-cane in Queensland. Development has been steady and continuous. To-day, 270,000 acres, in round figures, are cultivated for cane in this State.

### **The Department of Agriculture and Stock.**

With a growing population and realisation of the extraordinary richness of our virgin soils, agriculture gradually came into its own, and the story of its further development is familiar to most of us.

The importance of the rapidly developing industry was appreciated by later legislators, and, on the 18th June, 1887, the Department of Agriculture was instituted by Proclamation. For the first three and a-half years it was under the control of the Minister for Lands. It then became subject to administration under a separate portfolio, with its present-day designation. The history of the Department is bound up in the more recent history of land settlement and rural development in Queensland.

In the course of its existence, it has had nineteen Ministerial heads, each with a progressive policy suited to the needs and demands of his day.

Each period has seen new and perplexing problems arise and departmental policy shaped accordingly, but, perhaps, the peak of complexity was reached in the immediate post-war years, from 1918 onwards. It was then that agriculture was confronted with the unpleasant phenomena arising from a lack of a complete system of ordered marketing and organised distribution. The need, not for nationalising, but for rationalising the industry and for wringing out the water from inflated capital values, became more and more apparent.

The longest term of Ministerial office was served by the late W. N. Gillies, who, like the late A. J. Thynne, left a deep impress on the fortunes of agriculture in this State. A farmer himself, and the son of a farmer, he brought to his office a sound practical training in land matters, a comradeship with the primary producer, a ready sympathy with him in his economic problems, and a wide, wise, and comprehending vision.

### **Agricultural Legislation.**

As I have said, in the immediate post-war period, agriculture, not only in Queensland and Australia, but throughout the world, was faced with perplexing and unprecedented difficulties. So far as legislation could be applied to both cause and effect, it was applied in Queensland in a series of enactments that have aroused the interest, and often inspired the emulation, of authorities in other States and other countries. Queensland, a pioneer in industry and settlement and social improvement, became again a pioneer in agricultural legislation, and at the back of this were some very able and public-spirited Queenslanders, who supplied the dynamic force.

As a result of these activities, cotton-growing, practically non-existent, was raised to a promising industry. Systematic organisation of rural industry along co-operative lines was initiated. The Council of Agriculture, together with subsidiary organisations under farmer control, were established. The system of pooling of primary products was widely extended, and a fruit marketing system organised. Fodder and grain conservation schemes were brought into operation. The co-operative movement was strengthened; banana-growing was brought under strict white labour conditions, making it an entirely white man's industry. The stabilisation of the meat and dairying industries was advanced long stages nearer accomplishment. The Commonwealth Sugar Agreement was renewed. Sugar Cane Prices legislation was adjusted to make its operation more equitable to the growers. Advances to settlers were liberalised. The poultry industry was protected to the extent of minimising, as far as possible, the incidence of disease. A practical scheme for the improvement of draught farm-horses was launched successfully. Protection was given to farmers and orchardists in relation to specifics for insect pest destruction. Bird and animal sanctuaries were increased in number and area. The scientific and technical branches of the Department were extended, and the system of departmental publicity made more comprehensive in respect particularly to the effective filming of Queensland at work in rural industry as part of a considered scheme of rural educational propaganda.

### **Welfare of the Farmer.**

Reverting to the general work of the Agricultural Department, which is as I have claimed, bound up inseparably with the progress of agriculture in Queensland, a restatement—or rather, a brief outline or survey of its services—may be appropriate at the moment. To the man on the land Agriculture and Stock is the most important of our administrative departments, and it is fair, I think, to say that there are few countries in the world where the welfare of the farmer is more the concern of efficient and experienced officers than in Queensland. In every phase of inland enterprise, guidance is freely given by men whose personal knowledge of local conditions in every district and practical experience are at the disposal of anyone embarking on a life on the land.

Through the Sugar Experiment Stations the canegrower has the benefit of scientific advice and field service on the farm in every branch of his calling. Cane varieties are tested under every-day conditions, and sets supplied to the farmer. Sugar-mills, on the boards of which growers are represented directly, have been established in every chief district. The price of the product is regulated equitably by Cane Prices Boards, and through them every interest concerned is assured of a fair and square deal.

In general agriculture the Department puts on its dungarees and goes out into the paddock, so to speak, to supply expert advice and field guidance through its State-wide organisation. Wheat and maize breeders are ever at work evolving new types to suit varying conditions in each grain-growing zone, particularly in the Maranoa.

Specialists and graders give the farmer every possible assistance in respect to cotton cultivation, and the whole available resources of science and the services of a highly trained corps of scientists are at the call of the agriculturist in Queensland.

### **Dairying.**

Queensland is the only country in the world in which dairying is conducted in the tropics successfully on a big scale. Ninety-eight per cent. of our butter production and 96 per cent. of our cheese output are produced co-operatively, under farmer control.

Dairy instructors and inspectors operating throughout the producing regions are well equipped with the knowledge necessary to assist and inform the dairyman in every way. The dairy farmer has the advantage of expert advice on all matters relating to his calling, from sowing and improving pastures, through every phase of animal husbandry, to manufacturing, right to landing his finished product in cold store or on the London and other overseas markets. Herd testing and breed improvement each claim practical attention and direction.

Pig and poultry raisers are provided for amply in respect to expert advice. In every fruitgrowing district field instruction in cultivation, in contending with insect and vegetable pests, in grading, packing, shipping, and marketing, in the cultivation and marketing of tropical fruits, is available.

### **Classing Small Clips.**

The service and advice of experienced veterinary surgeons are always available to any stockowner in difficulties or needing practical guidance in any way. Similar services are available in respect to sheep and wool. Clips up to 1,500 fleeces from any one holding are classed at nominal cost and prepared for the salesmen's catalogues. In this way the interests of the small flock owner are conserved and his clip presented to the buyer in the best marketable form.

### **Science Service.**

In agricultural chemistry the Queensland farmer is served by men most eminent in their profession, and who form the staff of probably the best equipped laboratory of its kind in Australia. A special branch of the Department devotes itself to the protection of the farmer in respect to ensuring that seeds, stock food, fertilisers, and specifics for pest destruction are kept up to prescribed grades and standards.

And so one might go on much further to detail the excellent public services that have been established by the Queensland Government and are being extended to meet every development in agricultural progress in this State.

And though we have not yet arrived at the time when we may spend the day sunning ourselves in the glory of our own achievements, Queensland has a record in agricultural progress of which we may well be proud.

**PRIMARY PRODUCERS' ORGANISATION.****MINISTER'S SECOND-READING SPEECH ON AMENDING MEASURE.**

**Queensland is a primary producing State with great resources awaiting development; and it is necessary that all social organisation and economic development must have as a starting point a sound and scientific agricultural policy.—Mr. Forgan Smith.**

The Primary Producers' Organisation and Marketing Act Amendment Bill was among the more important measures presented to Parliament this session. Subjoined is an abridged report, taken from "Hansard," of the second-reading speech of Mr. W. Forgan Smith, the Minister for Agriculture and Stock, who introduced the Bill, and which is of especial interest to farmers.

The SECRETARY FOR AGRICULTURE (Hon. W. Forgan Smith, *Mackay*): The principal Act is a measure which endeavours to develop and extend the principle of co-operative marketing in Queensland. It deals with a subject of paramount interest to this and other States of the Commonwealth. At the present time every country is engaged in various forms of investigation with a view to developing forms of marketing which will organise agriculture on a better basis than hitherto with the object of making the life of the man on the land more attractive than it has been in the past. That is of particular importance to Queensland. We are a primary producing State with great resources awaiting development; and it is necessary that all social organisations and economic development must have as their starting point a sound agricultural policy, with a view to developing the latent resources of Queensland to provide a means of livelihood for a large section of our population; and also with a view to the general extension of the production of human needs on a more scientific basis than formerly.

My own personal view on this matter, and it is the view held by the Labour Party generally, is that this form of co-operative activity is the most significant and important factor in our social and economic life; and, according to the manner in which it is wisely developed and extended, so will the future prosperity of agriculture and agriculturists develop and extend in this State.

**Co-Operative Marketing.**

Various forms of criticism have been directed against this form of organisation and marketing. Arguments are put forward in favour of a proposition that men trained only in the tilling of the soil are not, of necessity, the best men to control the marketing of their product. While there may be some truth at the present time in a general statement of that description, one must realise that co-operative development on the marketing side is a development which must extend with time, and this form of organisation will require to train men to carry out satisfactorily to themselves the duties which co-operative organisations impose on them. Everything must have a beginning. In older countries, where co-operative development in other avenues of activity is more extensive than is the case here, the same arguments were used against those associations at their initiation; yet we know that in various countries where co-operative associations have been formed millions of pounds of capital are now at their disposal. Those organisations have trained their own men in the control of industry, and these men can now compete on favourable terms with the captains of industry employed by private enterprise. So far as Queensland is concerned, we need have no misgivings in this respect. Co-operative activity has been an achieved success in this State; and in countless different ways production and distribution has been carried on by these organisations with benefit to their members and with credit to those placed in control. It is well known that the need usually produces the man. I am satisfied that, with this form of organisation and marketing becoming a permanent feature of the activities of the State, time will develop a class of individuals capable of rising to the responsibilities demanded of them, who will carry out their duties in a commendable way with benefit to the members and to the organisations they represent. Naturally, measures of this kind require extension and development as time goes on; experience teaches the need of extension in certain directions, and of modification in others. It is our desire to frame the legislation in such a way that co-operative organisations will have complete facilities for carrying out their work in the manner in which Parliament intended.

The Bill now before the House amends the principal Act of 1926, and deals with certain sections of the Fruit Marketing Organisation Acts, the Primary Producers' Co-operative Associations Acts, and the Wheat Pool Acts.

### The Pooling System.

The first and most important amendment dealing with this measure is the majority required for the establishment of a pool. At the commencement of this legislation provision was made for a 75 per cent. majority, which was followed later by a two-thirds majority. With the knowledge and experience that producers have gained of the working of this Act, I am satisfied now that 60 per cent. is a satisfactory majority to initiate or carry on a pool. The idea of that majority is to ensure a sufficient volume of produce being supplied by a sufficient number of individuals to give the organisation a fair start. As one hon. member mentioned yesterday, if the margin was too narrow, there would be a tendency for the opposition to "white ant" the organisation before it was properly called into being. (Opposition laughter.) Hon. members may laugh at such a suggestion. We know, of course, that any change in the economic organisation of society involving a change in the exercise of economic power from one set of individuals to another evokes serious and strenuous opposition by the organisations which the new one is established to displace; they do not desire to have control taken out of their hands without a struggle being put up against it. As a matter of fact, the fruit-marketing organisations have found it necessary to exact a pledge from candidates for office in certain positions that they are not connected with agents in any other than a proper business way; in other words, that pledge is exacted to ensure that the nominees of agents are not secured for a purpose alien to the principles of the Act. However, be that as it may, I am satisfied that a 60 per cent. majority will be satisfactory in connection with all future pools.

For the continuance of the operation of existing pools, the Governor in Council will be given authority under this Bill to extend the life of the pool for a further period subject to ratification, if a vote is demanded by 10 per cent. of the growers affected. If 10 per cent. of the growers affected petition for a poll, a poll will be taken, and a simple majority only be required for the extension of the pool.

### The Initiation of Pools.

In connection with ballots for the initiation of new pools, before any pool can be set in operation it will be necessary for a 50 per cent. effective vote of those known to be entitled to vote to be recorded before such initiation can take place. One can realise that it is sometimes difficult to compile a roll of those entitled to vote, because growers may change their crop from year to year, and a man who might be a voter one year may not be entitled to vote the next year.

The usual method adopted by the department is that those desiring to vote—and it is further extended under this Bill—must sign a satisfactory statutory declaration indicating that they belong to the class of grower defined in the Order in Council. Of the prepared roll under these conditions it will be necessary for a 50 per cent. poll of those entitled to vote to be recorded before a pool can take place.

### Pools in Operation.

For the information of the House, I might give some idea of the scope of marketing control boards in this State.

The following figures for the year ended 30th June, 1926, show the value of the various commodities controlled by each commodity or marketing board—

	£
Sugar-cane .. .. .	6,354,625
Butter .. .. .	5,079,857
Fruit .. .. .	1,454,304
Cheese .. .. .	582,522
Wheat .. .. .	534,483
Cotton .. .. .	379,331
Eggs .. .. .	248,032
Atherton maize .. .. .	78,500
Arrowroot .. .. .	23,526
Atherton pig .. .. .	16,200
Canary seed .. .. .	9,390
Peanuts .. .. .	8,566
Broom millet .. .. .	1,600
<b>Total value .. .. .</b>	<b>£14,770,936</b>

Those figures indicate that a very large volume of agricultural production of Queensland is controlled by marketing boards exercising powers conferred on them by legislation passed in this Parliament. The value of agricultural production of

the State, including dairying, poultry, and bee farming, for the year ended June, 1926, amounted to £18,932,840. Of this amount, agricultural products to the value of £14,770,936, or 78 per cent., were under the control of commodity or marketing boards. The general policy has been uniformly successful from the inception. There is no single case of any marketing board having been unsuccessful in its operation, and all have been maintained on a sound financial basis. From time to time the Government have either made advances of credits to those boards or have guaranteed credits. In other cases financial institutions, without any guarantee from the Government at all, have provided them with the necessary fluid capital to carry on their operations. In every case these marketing boards have met their obligations, and not one penny of Government guarantee has been called up. All that indicates a very healthy state of affairs with regard to this form of policy, and justifies the Government in continuing this line of activity.

### Favoured by Producers.

Further tangible evidence of the confidence of the producers in the pooling system is the fact that, when votes have been taken on the question of the continuance or otherwise of an existing pool, an increasing percentage is invariably noted in the number of producers for the carrying on of the pool concerned. For example, the various pools now operating have been adopted on the following majorities:—

Arrowroot, established in 1922 without any opposition.

Atherton Maize, established in 1923 without any opposition.

Northern Pig, established in 1923 without any opposition; renewed in 1926 without any opposition.

Broom Millet, established in 1926 without any opposition.

Butter, established in 1925 by a 75 per cent. majority; renewed in 1928 without any opposition.

Canary Seed, established in 1925 by a 75 per cent. majority; renewed in 1928 without any opposition.

Cheese, established in 1922 by a 91 per cent. majority; renewed in 1925 without any opposition; renewed in 1927 without any opposition.

Cotton, established in 1926 without any opposition.

Eggs, established in 1923 by an 87 per cent. majority; established in 1925 by a 73 per cent. majority; renewed in 1926 by a 66½ per cent. majority.

That indicates a falling off in the percentages of those in favour of pooling, which is often due to a greater number of poultry farmers being brought within the ambit of the pool—

Peanuts, established in 1924 without any opposition; renewed in 1925 without any opposition; renewed in 1926 by a 90 per cent. majority.

Stanthorpe Tomatoes (superseded by Committee of Direction), established in 1922 by a 78 per cent. majority.

Wheat (under the Wheat Pool Act), established in 1921 by a 97½ per cent. majority; extended in 1924 by an 89 per cent. majority; extended in 1928 without any effective opposition.

When the life of an existing pool now expires, the action taken is practically to start a new pool. The amending Bill proposes to give the Governor in Council power to extend the life of an expiring pool. The provisions regarding the petition for a vote are the same as apply to the initiation, with the exception that the life of an existing pool can be carried on for a further period of years by a simple majority.

### Safeguarding Ballots.

In regard to the taking of the ballot, further provisions are contained in this Bill to see that the ballot is taken in a proper manner and is representative of all interests concerned. The practice now is for the producer to claim and record his vote in the one operation. The amending Bill will enable regulations to be issued requiring the claimant for a vote to give a statutory declaration, witnessed by a responsible person, that he is eligible to vote. This will enable the returning officer to require those claiming votes to give a similar declaration to that now given by persons applying for an electoral vote. For instance, in the case of a petition to protest against the extension of the Committee of Direction, the present legislation is rather indefinite as to what constitutes a commercial fruitgrower, interested or otherwise in the future of the Committee of Direction.

Mr. Moore: No declaration would be necessary under this Bill, because the pool would have the name of every producer.

**THE SECRETARY FOR AGRICULTURE:** In connection with the poll for the renewal of a pool the roll would comprise those who were in the pool the previous season. Those who have in other cases actually a crop under cultivation may be brought under the scope of a new pool. It is quite reasonable and just that that should be so. For example, a man may become interested in wheatgrowing for the first time. He may have a considerable acreage of wheat planted. It would be grossly unfair for that new grower to be debarred from a vote for the creation of a pool that might affect him for the succeeding five years in succession to the present one. Every provision that human ingenuity can devise is made in this Bill and the principal Act to secure to the grower those rights which are given to him and to see that effect is given to the principles which I have enunciated.

### **Intimidation Illegal.**

As I explained yesterday, another provision in the Bill deals with attempts to intimidate or coerce farmers voting under the Bill. It is proposed to make it a criminal offence to attempt to intimidate a producer in the exercise of the franchise at a ballot for the constitution of a pool board. The Bill provides for a penalty of a fine of £200 or imprisonment for one year in respect of an offence of this nature. The provisions of the clause are the same as those which have been in the Criminal Code since 1899. No interference will be made with stating the case either for or against a pool. The Bill deals only with corrupt practices in a similar way to the Criminal Code in respect of general elections for Parliament. It will be an offence for a man to use economic intimidation against a farmer with a view to diverting a vote in one or the other direction. The principle underlying this provision is this: By this measure the farmer has machinery given to him whereby he can control his own industry, so that by co-operative means for improvements in marketing conditions he may attain for himself everything that he deems in his interests. Therefore, it is entirely a matter for the farmer himself to decide whether he will come under such an arrangement or not. As a Government we do not say that the farmer shall adopt this method of organisation. We say that we believe that this form of organisation, used properly and managed efficiently, will improve the conditions of the farmer, or, at any rate, will give him the opportunity to improve his conditions.

The defence put up yesterday by the Leader of the Opposition, that a storekeeper had the right to protect his own interests, has no real bearing on this question at all. A storekeeper conducts his business in the ordinary way. He sells goods to a farmer at a price which he fixes, and, included in which are his overhead charges and his margin of profit. Can it be seriously suggested that not only does the farmer owe him the amount due for the goods he has purchased but that the farmer is also under an obligation to sell to that storekeeper his own produce at any price fixed by the latter? If there is anything at all in the case put forward by the Leader of the Opposition, that is the logic of it. (Opposition dissent.) In other words, his contention yesterday meant that, if a storekeeper gives credit to a farmer, he has the right to say to that farmer, "You must do all your business through me at prices and under conditions which I dictate." (Opposition dissent.) All that the storekeeper has any right to get is the payment of the amount that is legally due by the farmer, the latter being left with the opportunity to sell his goods in the best market obtainable for them.

The suggestion was also made that, if a pool was formed, the farmer would be able to repudiate his obligations.

### **Better Prices for the Grower.**

No one knows better than the Deputy Leader of the Opposition that that is not the case. Pooling usually results in better prices being obtained by the grower, and more advantages accruing to him financially; and he is in a better position to meet his liabilities than formerly. All money held by a pool board or a sugar-mill can be distrained on behalf of a creditor. Therefore, instead of the business of a storekeeper being affected by a measure of this kind, the business is conducted in a legitimate way, whereby the farmer, by improved organisation secures the better price for his product, and is in a better position to meet his liabilities than hitherto. . . . Everyone realises that there are certain economic interests operating in the community, and I understand that hon. members opposite have been placed in great difficulty, when claiming to be representative of country interests, when economic interests are pulling them in other directions.

I also wish to refer to the fact that under this Bill provision is made for two or more pools to be amalgamated or for the subdivision of an existing pool. Under the

Companies Acts, complete provisions exist for amalgamations, absorptions, subdivisions, reconstructions, and the like. This Bill contemplates similar machinery for the primary producers. Amalgamations will be subject to the right of the growers to have a referendum, which will be carried if 50 per cent. or more vote for the amalgamation.

With regard to pool boards which may have been in operation for some years, provision is made for the appointment by the Supreme Court of a liquidator for the winding-up of the affairs of such an organisation if it goes out of existence. The same provisions apply with regard to that as would apply to co-operative associations registered under the Primary Producers' Co-operative Association Act, or to a company registered under the Companies Act. This provision deals with a question such as this, which often arises: A pool board having built up certain assets, how shall those assets be disposed of in the event of the pool not being continued? There is power under this Bill for such a board to be put into liquidation and a liquidator appointed by the Supreme Court in the same manner as a liquidator is appointed under similar circumstances in connection with a company.

### **Building up Reserves.**

A further important provision in this Bill is that relating to the building up of reserves. At the present time pool boards have authority, with the approval of the Secretary for Agriculture, to levy for administrative purposes or for insurance or other special objects of benefit to the growers. This Bill gives further provisions and powers with regard to the building up of reserves. I regard this as a very important phase of this legislation. I said at the beginning of my speech that, if this method of organisation is going to be a permanent feature, as I hope it will be, of the economic organisation of this State, it is desirable and necessary that reserves be built up and the finances of the boards controlled in such a way that they will be independent, financially and otherwise, of any Government that may be in existence. In other words, we want to build up these co-operative organisations in such a way that, by virtue of their own assets, their own business acumen, and the resources they control, they will be able to arrange for the necessary finance without having to undergo any disability or make any appeal to any existing organisation. Further, a wider power is given under the Bill to establish reserves. For example, it may be desirable for a board to establish a reserve fund with a view to providing for certain benefits to the industry as a whole, and, perhaps, financing seed for an ensuing crop; and in countless different ways advantages can be gained by the building up of reserves in the manner I have suggested. It is quite unnecessary for me to dilate at any greater length on that matter. Everyone realises that a sound business concern carefully builds up reserves in good years to enable it to tide over difficulties in a bad year.

A further provision in the Bill deals with Mossman, and creates it a separate district in the organisation dealing with the sugar industry. The Queensland Cane Growers' Council have asked for this, and the Mossman people, supported by the hon. member for Cook, in which electorate Mossman is situated, have been continually urging that this should be done. Mossman is a self-contained district, isolated to some extent from other portions of the State, and the people there desire an organisation of their own, and they will be given an opportunity under this Bill to have it.

### **Commodity Board Majorities.**

The Bill also amends the Fruit Marketing Organisation Acts and gives the Committee of Direction power to raise money on the security of the fruit. It provides that the majority in a referendum shall be reduced from two-thirds to three-fifths to bring the Committee of Direction into line with other commodity boards. As from 1st January, 1930, subject to the right of 500 growers demanding a poll, they will be given a further lease of activity under this Bill. At the present time they continue until 1st January, 1930. That power was extended by Order in Council for a period prescribed in the principal Act. No petition was received to enable a poll being taken, therefore the Committee of Direction of Fruit Marketing was continued for a further period. This Bill provides for a further five years after 1930, subject to a poll being demanded by 500 growers or the equivalent of 10 per cent. of the organised fruitgrowers affected by this organisation.

### **Fruit Marketing.**

The Bill also deals with the provision relating to fruit barrows. In the principal Act the Committee of Direction is empowered to license fruit barrows and impose a license fee. That power is being deleted from the principal Act, and authority will

now vest with the Home Department to set up regulations for their control, having regard to the proper control of traffic within city or urban areas generally.

It is not intended to exclude fruit barrows from the streets entirely. It is recognised in almost every large centre of population that they constitute a method of trading which enables the people to get fruit at a reasonable price. They, therefore, supply a legitimate service. The Bill simply removes the control from the Committee of Direction, and enables the Home Department to bring into being machinery for the effective and proper control of the barrows, having regard to the traffic interests of city and urban populations.

The Bill also limits the number of members of a sectional group committee to a maximum of ten. As at present constituted, these committees number—

Banana	..	..	..	..	..	..	..	..	23
Pineapple	..	..	..	..	..	..	..	..	16
Citrus	..	..	..	..	..	..	..	..	9
Deciduous	..	..	..	..	..	..	..	..	9
Other fruits	..	..	..	..	..	..	..	..	12

The reduction in numbers of sectional group committees will not become operative until the terms of office of the existing committees expire in August next. This limitation is in accordance with the principle obtaining in the organisation of sugar-growers, mill suppliers' committees being limited to not more than ten members, who have been found sufficient to carry on the business effectively and efficiently. I have no belief in large committees, and I have been satisfied that representative committees of not more than ten can be established and worked efficiently.

### Committee of Direction.

A further provision deals with the power to take and conduct a ballot as to the advisableness of continuing the Committee of Direction with a view to bringing it under the Primary Producers' Organisation Act. This is a similar provision to that in the Wheat Pool Act, and leaves the initiative and control to the growers themselves. If they desire it, the fruitgrowers can apply under this measure to constitute a marketing board under the Primary Producers Organisation Act, and, on the taking of a vote in the affirmative, the Committee of Direction would go out of existence and a marketing board be formed.

### Co-operative Associations.

A further provision deals with the acquisition by co-operative associations of the assets of companies registered under the Companies Acts and in liquidation. Under the Companies Acts it is provided that a company so registered may sell to a company under conditions set out in the order of the court. Under those Acts a co-operative association is not a company; but this proposed amendment of the Primary Producers' Co-operative Associations Act will enable such associations to acquire the assets of a limited liability company in a manner satisfactory to both. The converse, however, will not apply, for obvious reasons.

### Co-operative Control.

The tendency in agricultural organisation is in the direction of co-operative control. In the dairying industry, for example, 98 per cent. of our butter and 95 per cent. of our cheese is manufactured by co-operative concerns; but, as the law now stands, companies of a proprietary character, such as those registered under the Companies Acts, would not, upon liquidation, be authorised or, at any rate, would have some difficulty in disposing of their assets to a company to be formed under the Primary Producers' Co-operative Associations Act. The Bill proposes to remove that disability, and, therefore, makes provision for an extension of co-operative activity in that direction.

### Wheat Board.

The next series of amendments deals with properties acquired by the Wheat Board, which, by means of loans from this Government, has built a number of grain sheds and acquired others in various situations for the effective handling of its crop. In addition, the Government purchased for a considerable sum of money the property in Toowoomba known as "The Maltings." This Bill provides that, when the amount of the indebtedness due to the Government is liquidated by the Wheat Board, the titles to these assets will be handed over to the board—titles equivalent to those which were purchased on its behalf.

In connection with the buildings on lands held by the Railway Department, the Commissioner for Railways will be authorised to issue leases under conditions satisfactory to both interests concerned. With regard to property of freehold character acquired, the title will be equal to that which was purchased, and will be given to the Wheat Board on the paying off of all their indebtedness.

Power is also given, with the permission of the Treasurer, to dispose of some of the assets of the board, provided that moneys so accruing shall be paid to the Treasury in liquidation of their debt. That I consider to be a fair and reasonable proposition. It increases the financial stability, and enables existing boards to build up real assets, which give a definite form of security enabling them to obtain advances from time to time for carrying on their operations.

### **Farmers to Control their Own Business.**

I think I have outlined the main provisions of this Bill. I have endeavoured to show to the House the necessity for the amendments we are placing before it. I am satisfied that, when this Bill becomes law, it will facilitate to a considerable extent the principle and management of co-operative organisations in this State. It will give the farmers a further opportunity to control their industries in a manner beneficial to them. It must be remembered, however, that in dealing with co-operative organisation the words, "co-operative" or "organisation" of themselves do not confer any benefit. For any benefit to be conferred by a new form of organisation it must be more efficient than the form of organisation which it seeks to displace.

### **To Reduce Costs of Production.**

Co-operative organisation wisely managed and efficiently controlled, by eliminating waste in various directions, can reduce costs and enable a greater return to accrue to the farmer. By well-devised and orderly marketing gluts can be prevented, depressions guarded against; and in countless different ways orderly marketing or orderly supply of goods to a market can be of benefit to all concerned. Why should the farmer be the only individual who has no control over the marketing of his own produce? Almost every other form of human activity that produces has some foreknowledge of the marketing conditions. The demand that there will be for a given product in a given market at a given time can be estimated with a degree of accuracy; and organisation can be so effected as to supply that market regularly with a view to preventing low prices and panic from time to time.

### **Organisation and Orderly Control.**

These are the days of organisation and orderly control; and, if that organisation and control are carried out in a manner not detrimental to the public interest, it will be of distinct benefit to society. Most of the difficulties in the world at the present time are due to bad organisation in production and distribution. Where production exceeds consumption under a given form of organisation, various periods of trade depression take place with resultant difficulties to all concerned. With modern methods and machinery, the productive power of mankind in industry has increased enormously. Production can be carried on with greater rapidity than consumption can overtake it; and, as a result, you have a cycle of recurring trade depressions taking place within a narrow ambit of social organisation. Therefore, the remedy is the orderly marketing and orderly control of industry with a view to estimating and supplying human needs.

### **Better Conditions for the Farmer.**

Orderly marketing by a scientific organisation, which can be established under this Bill, will enable the farmers, provided they use it properly, to obtain better conditions for themselves, and by those better conditions better organisation improving the conditions of the great bulk of the people generally, and thus be of benefit to the people as a whole. Gluts are no good to the farmers. They mean that, when he has large crops, either through bad organisation or bad marketing, he gets a very small price, and on some occasions no price worth while at all. In other cases when prices are high he has little or no produce to sell. Those methods are bad both for the farmer and for the people who use his produce. Of course, climatic conditions cannot be completely controlled; but I am satisfied that, with the application of proper methods, under a measure of this kind, many of the difficulties can be removed. If, therefore, this Bill is a further step in this direction, then we in this Parliament will have done something worth while, and something which will be of benefit not only to the people concerned but to the State as a whole. I therefore have much pleasure in moving—

"That the Bill be now read a second time."

## QUEENSLAND PRODUCERS' ASSOCIATION.

### A YEAR OF EXPERIENCE.

**“W**E have had a year of experience in working the organisation on a commodity basis. I have watched the work of the various organisations during the past year, and am quite satisfied, speaking generally, that progress has been made, and the legislation of 1926 has been fully justified.”

The foregoing remarks were made by the retiring president (Mr. W. Forgan Smith, Minister for Agriculture) at the last annual meeting of the Council of Agriculture and conference of delegates of the Queensland Producers' Association. The organisation of the farming industry and of the marketing of the farmers' produce was a problem difficult for any Government or Parliament to solve, he continued, for so many varied interests were involved, and so many commodities were subject to different economic conditions. To set up an organisation such as the Queensland Producers' Association it was necessary to carefully observe all the progress that was made, and adapt the organisation in accordance with the experience gained. In other words, the success of co-operative organisation among the farmers was a matter of gradual progress. “I think it can be said,” added the Minister, “that in view of the work of the organisation in this State you can only come to the one conclusion, and that is that it has been completely justified, and that it has marked the beginning of a new era for the man engaged in primary production.”

### Commonwealth Organisation.

During the past year you have had to encounter many difficulties that are incidental to your work, and I am satisfied that the commodity boards have carried out their duties satisfactorily, and in a manner that has been of advantage to the people they represent. In the course of the year there was a conference on the question of the establishment of a Commonwealth organisation. In that connection I note with pleasure that Mr. McRobert, one of your representatives, was called upon to be chairman. I regard that as a distinct compliment to the farmers in Queensland. I look forward to the time when producers' interests throughout Australia will be organised on a Commonwealth basis, with the producers themselves co-operatively controlling the industry, improving conditions generally, and in that way building up the wealth and resources of the Commonwealth of Australia.” In dealing with the future, Mr. Smith indicated to the meeting certain amendments he proposed to bring forward with regard to “*The Primary Producers' Organisation and Marketing Act of 1926*,” the Fruit Marketing Act, and the Stock Foods Act. The proposals outlined were unanimously endorsed.

### A Review.

The annual report of the executive committee, after outlining its work in connection with the farm workers' award, the Marketing Act, and the Australian-wide organisation, reviewed the position generally. The report stated that the committee was in a position to indicate that it had kept well within the vote provided at the last annual meeting, namely, £6,000. The actual expenditure in accordance with the budget indicated was only a little over £4,000. The committee urged that no cognisance should be taken of those enemies of farmer organisations who stated that the various branches were not meeting as frequently as was the case in earlier years, and were not being as well attended. There was a very sound reason for this, in that when the organisation first commenced to function only two industries were organised at the marketing end. At the present time every important agricultural industry in the State was organised at the marketing end with the exception of maize, pigs, and fodder. In these circumstances, there was not the same necessity for the active functioning of the branches. The branches, nevertheless, remained, and when occasion demanded, as experience showed, they could be speedily galvanised into life. The committee in this regard had in view proposals having for their objective the holding of periodical public meetings of farmers in the more important country centres, at which instructional lectures would be given. The committee submitted a budget for the ensuing twelve months, amounting to £6,000, and suggested the precepting of the various boards on the same lines as last year.

After debate the report and recommendations were adopted unanimously, and the president, to whom appreciative reference was made, was accorded a vote of thanks.

The election of officers resulted:—Chairman, Mr. W. Forgan Smith (Minister for Agriculture); vice-chairman, Mr. James McRobert; executive committee, Messrs. H. T. Anderson, J. Archibald, J. McRobert, and W. J. Sloan.

Several speakers, including Messrs. J. McRobert (Butter Board), A. S. Douglas (Wide Bay), W. L. Osborne (South Burnett), in congratulating Mr. Forgan Smith upon his re-election, expressed appreciation and approval of his able and effective work on behalf of the rural industries, commending the fact that he had at no time exhibited political partisanship, but had worked in the best interests of Queensland.

Mr. Chris. Sheehy, formerly of the Department of Agriculture and Stock, is the very capable secretary of the organisation, and in that office he has given and continues to give very valuable service to the farmers of Queensland.

### LAMB MARKING PRECAUTIONS.

With the period for lamb marking impending, it is well to keep in mind an aspect of the operation, neglect of which is every year the cause of appreciable loss.

Each season during the period in which lambs are subjected to the operation of marking, reports are received of deaths closely following, and investigation has shown that this mortality is due in the majority of cases to one or another of certain inoculable diseases (notably tetanus and blood-poisoning), the germs of which have entered the system of the animal through the wounds.

In order to prevent mortality caused by tailing, &c., it is necessary to prevent this wound infection. It is certain that in most cases the contagion is present in the sheep yards, and is consequently extremely difficult to get rid of. Experiment has shown that a solution of the earth from the surface of a yard may be so full of disease organisms as to be fatal to two out of four animals inoculated with it. In view of this, and the knowledge that various micro-organisms may remain alive for years in the soil, certain protective measures are highly imperative.

When marking small flocks, it is best to use temporary yards made of movable hurdles situated in a fresh paddock. With large flocks this is perhaps impracticable, and the following treatment of the yards is recommended: Remove the surface soil of the yards to a depth of about 6 inches, and place it in a heap, where it should be thoroughly mixed with quicklime. Then saturate the fresh surface exposed with a strong solution of non-poisonous sheep dip.

In addition to the above precautionary measure it is essential to adopt some means of preventing the germs of disease from gaining entrance into the flesh-cuts made in the scrotum and tail. As the yards, although the main, are not the only source of infection, it is recommended that wounds of the scrotum and tail be either smeared with tar or dressed with carbolised oil (1 part of carbolic acid to 12 parts of oil) before the lamb is released after the operation. This is most important.

Knives used for docking and tailing should be boiled, and not allowed to come in contact with the ground during use.

Lambs dead of the diseases, if not destroyed, form fresh centres of infection by absorption of the micro-organism by the earth. All carcasses should therefore be destroyed by burning. Finally, if measures are not taken to prevent these diseases, the losses, in addition to occurring annually, will show a tendency to increase in extent by reason of the increased soil contamination.

The operations of ear-marking and tailing, together with the castration of the male lambs, are usually carried out at the same period, generally when the lambs are between three and six weeks old. There is considerable diversity of opinion among sheep-breeders as to the most suitable age for performing these operations, some claiming that at a fortnight old there is least risk to the animal through loss of blood, while others prefer a later age, even up to three months, claiming that the lamb has then grown sufficiently to withstand the shock. In cold districts and severe seasons, the additional warmth and protection afforded the hindquarters is a reasonable argument for delay, but under average conditions it is generally conceded that from three to six weeks is the safest age for tailing and castration. Where the lambing season is protracted there will naturally be considerable difference between the ages of the lambs dropped first and those dropped last, and it may be necessary to mark the drop in two portions with an interval of a month between.

The sheep should be mustered some time before, and the lambs allowed to settle down before the operations commence. There should be no rushing about, and dogs should be used as little as possible, as deaths from hemorrhage are very common when lambs are marked in an excited and overheated condition. Both sexes may be treated at the same time, and a useful check will be obtained of the numbers and sexes marked if the tails of the male and female lambs are thrown into separate heaps.—“A. & P.” Notes, N.S.W., Dept. Ag.

## *From Now to Next Shearing*

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This can be done by the constant use of VITA-LICK.

*Mr. G. A. Wright, Armidale, writes—*

"The best and most practical expression we can give of our opinion of your product we have already given—that is, continued use and repetition of orders..... We have used nothing else for more than five years."

Mr. Wright has used over 500 tons for his stock in about six years.

*Mr. Frank Mering, Burghersdorp, South Africa, writes—*

"Although I am always tardy in giving Testimonials, I have no compunction in saying that I have used Vita-Lick for three years and that my stock have greatly benefited. I consider Vita-Lick an excellent all-round Lick for all classes of stock."

Use "D" formula for Dry Feed.

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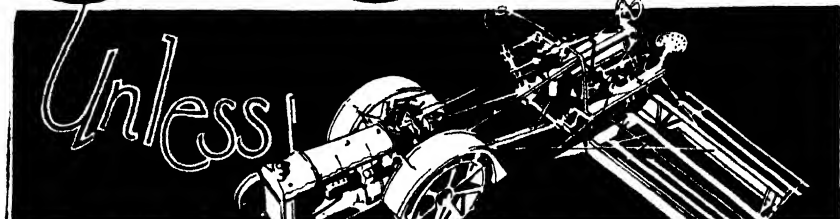
the weather conditions are favourable. Why not be independent of the weather by providing your own water supply and

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*Wheat Farmers find the Inventions effect*

*II Economies :—*

1. Approximately 40% Saving of Kerosene.
2. Reduces the Harvesting time by 33%.
3. Lengthens the life of the header, by, we estimate, double.
4. Prevents Loss of Grain, as the speed of machinery can be constantly maintained to ensure threshing and winnowing speeds.
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6. The outfit is mobile; it turns in its own length and may be backed if necessary.
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8. It ensures better work in dirty crops, as speeds are arranged to suit.
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10. Wheel slippage and side draught entirely eliminated.
11. One man can control both header and harvester if the I.X.L. Extension One-Man Control is utilised.

*They may be fitted to any of these Tractors*

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McCormick-Deering, 10-20 and 15-30  
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## DAIRYING IN QUEENSLAND.

The Minister for Agriculture and Stock (the Hon. W. Forgan Smith) announced last year the appointment of a Departmental Committee to make a survey of economic facts relating to some important phases of agriculture in Queensland.

The Committee has met from time to time and has collected and collated much useful data. The Minister has previously announced his intention of conveying some conclusions based upon this data to producers through a series of Bulletins.

In the first Bulletin the present conditions in the industry in Queensland were reviewed briefly. In the second Bulletin three outstanding factors were elucidated and stressed, namely:—The need of herd improvement; the importance of feeding; and the necessity of herd testing.

In this (the third Bulletin) the points briefly considered are stock foods and the manufacture and marketing of dairy products.

This Bulletin not only sets these forth as meriting the immediate attention of those engaged in the industry, but also extends a standing invitation to dairymen to avail themselves of the helping hand of the Department and of the facilities which it offers.

The dairying industry in Queensland is conducted on strictly co-operative lines. The shareholders in a Co-operative Dairy Company Association are suppliers of milk or cream to factories and through their elective board control their company's undertakings.

The managerial objective is to profitably manufacture the highest quality product and so market it that the producer will receive the highest possible return for his milk or cream on a quantity and quality basis. The payment of dividends on shares held by suppliers is restricted to an interest charge of 5 per cent.; no profits are distributed to shareholders in the form of dividends.

**Queensland is the only country in the world in which dairying is carried on successfully, and on a large scale within the tropics.**

The capital invested in dairy factories totals approximately £35,000,000, while individual factories representing a capital value of from £30,000 to £60,000 are operating in the old-established dairy districts. Most of the butter factories are constructed of concrete or brick and are modern in design and equipment.

The provisions of the Dairy Produce Act of 1920 safeguard and promote all interests in the industry. Inspectors see to the maintenance of high standards of hygiene; and processes of manufacture are carried

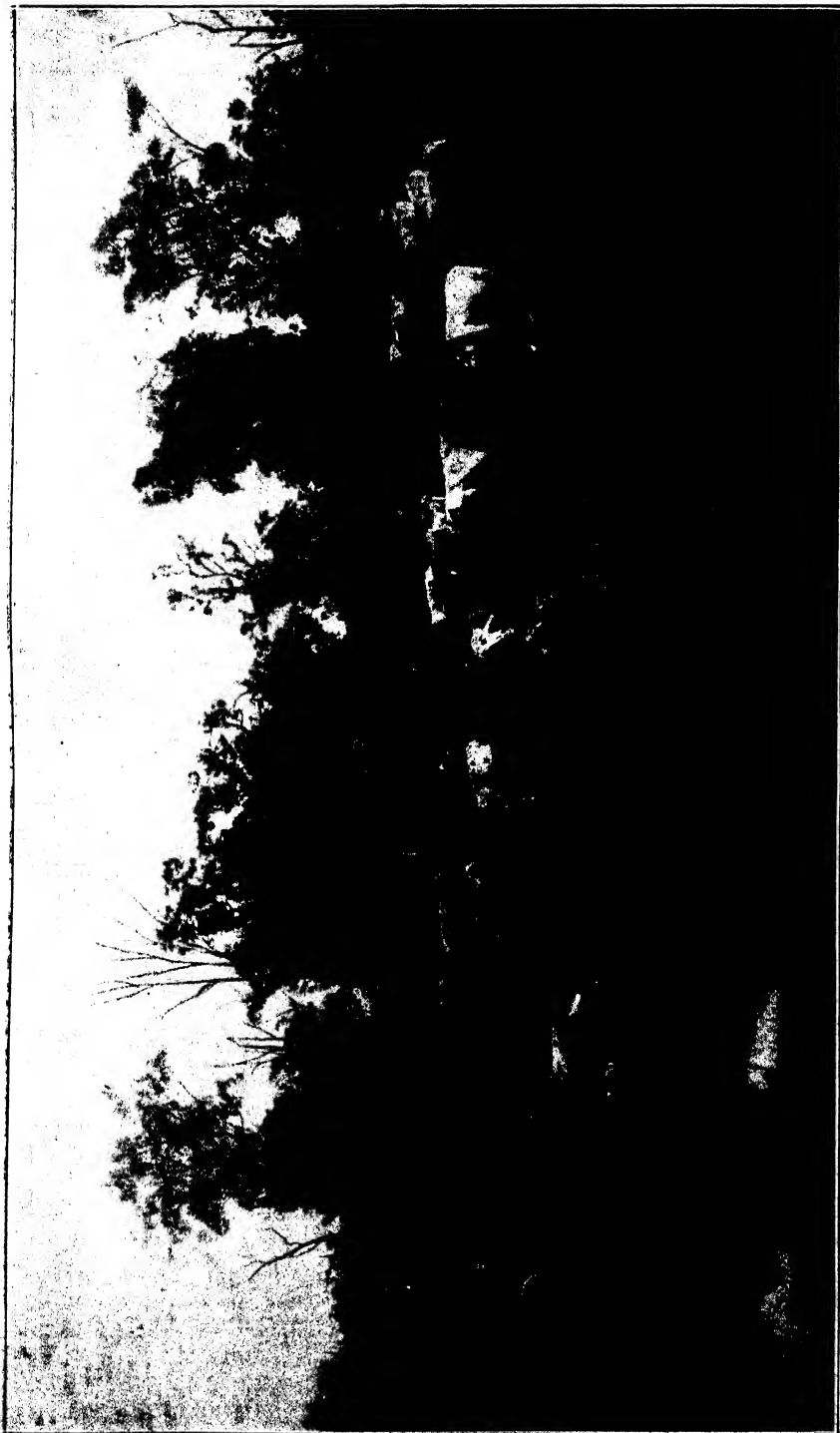


PLATE 84.—A QUEENSLAND DAIRY HERD.

out by operatives who have, by examination in theory and practice, proved their efficiency and hold certificates of proficiency. All dairy products are graded by qualified graders. Payments for cream are made on a commercial butter basis, and for milk on a butter-fat basis. In the interests of suppliers, a continuous audit is made of each company's books and accounts.

**Where the cow is kept and cared for the country advances, lands grow richer, homes become better, and general comfort increases.**

The Department of Agriculture and Stock has given valuable assistance in the development of dairying within the State. In its initial stage the operation of a travelling dairy for instructional purposes did much to encourage the establishment of the industry. The work of Departmental officers in the interests of the industry includes the services of the Agricultural Chemist, Bacteriologist, Botanist, Veterinary Surgeons, Instructors, Grading Inspectors, Dairy Inspectors, and Herd Testers.

Pool Boards functioning under the provisions of the Primary Producers' Organisation and Marketing Act have given valuable service to the industry by their support of administrative action tending to improve the quality of dairy products, and also by their association with marketing activities.

The development of butter and cheese manufacture in Queensland has been along scientific lines.

**The cow is the Mother of Prosperity on Queensland's dairy lands.**

### **STOCK FOODS.**

The wealth of our State is based to a very large extent on the number of our live stock, and the welfare of the stock again depends entirely on the feeding, therefore the question **how, when, and what to feed** is of greatest importance to farmer and grazier. All our live stock can be regarded as living factories producing from the feed consumed products useful to man.

### **Objects of Feeding.**

The body of the young animal requires a sufficient amount of food to supply the materials necessary for its growth. But even during any part of the growing stage there is a continual breaking down and wearing out of all the tissues of the body, and this loss must be made up by the nutrients contained in the food to maintain the animal in a normal healthy condition. Additional food is required to produce the energy for the carrying out of all voluntary and involuntary functions of the body. An animal working hard is using up a large amount of fat and muscle, but even an animal at rest requires food for the production of heat and other involuntary

functions of its body. Summarised the objects of feeding are as follow:—

- (1) To maintain bodily heat;
- (2) To repair waste tissues;
- (3) To reproduce young;
- (4) To form new tissues and organs;
- (5) To perform muscular labour;
- (6) To secrete various products;
- (7) To lay up reserve stores.

**There is a place for the cow in the agriculture of every country.**

### Composition of Foods.

In order to get a clear insight into the art of feeding and carrying out of the objects above mentioned, we must understand the composition of the tissues that require building and renewing, and the composition of the foodstuffs available.

The composition of any stock food, analysed according to present conventional methods, is expressed as follows:—

Lucerne hay (in full flower) contains:

Moisture .. .. .	10.0 per cent.
Crude protein .. .. .	15.0 per cent.
Crude fat .. .. .	2.8 per cent.
Carbohydrates or nitrogen free extract, by difference	33.2 per cent.
Crude fibre .. .. .	31.0 per cent.
Ash .. .. .	8.0 per cent.
	100.0 per cent.

Putting these results in another form, we find—

I. Moisture .. .. .	10.0 per cent.
II. Dry matter .. .. .	90.0 per cent.
(A.) Ash or mineral matter .. .. .	8.0 per cent.
(B.) Organic matter 82.0 per cent.	<div style="display: inline-block; vertical-align: middle;"> <div style="font-size: 3em; vertical-align: middle; margin-right: 5px;">{</div> <div> Proteins .. 15.0 per cent.  Fats .. 2.8 per cent.  Carbohydrates 33.2 per cent.  Fibre .. 31.0 per cent. </div> </div>

**The cow produces the goods, but man must do his part in raising and maintaining standards of quality.**

### RATIONS FOR DAIRY COWS.

The Agricultural Chemist, Mr. J. C. Brünnich, has written a Bulletin entitled "Stock Foods," in which the objects of feeding, description and analyses of various stock foods, and the making up of rations are all very fully detailed, and with this information the dairy farmer can judge how to feed to the best advantage. This Bulletin is available free of charge to every dairy farmer.

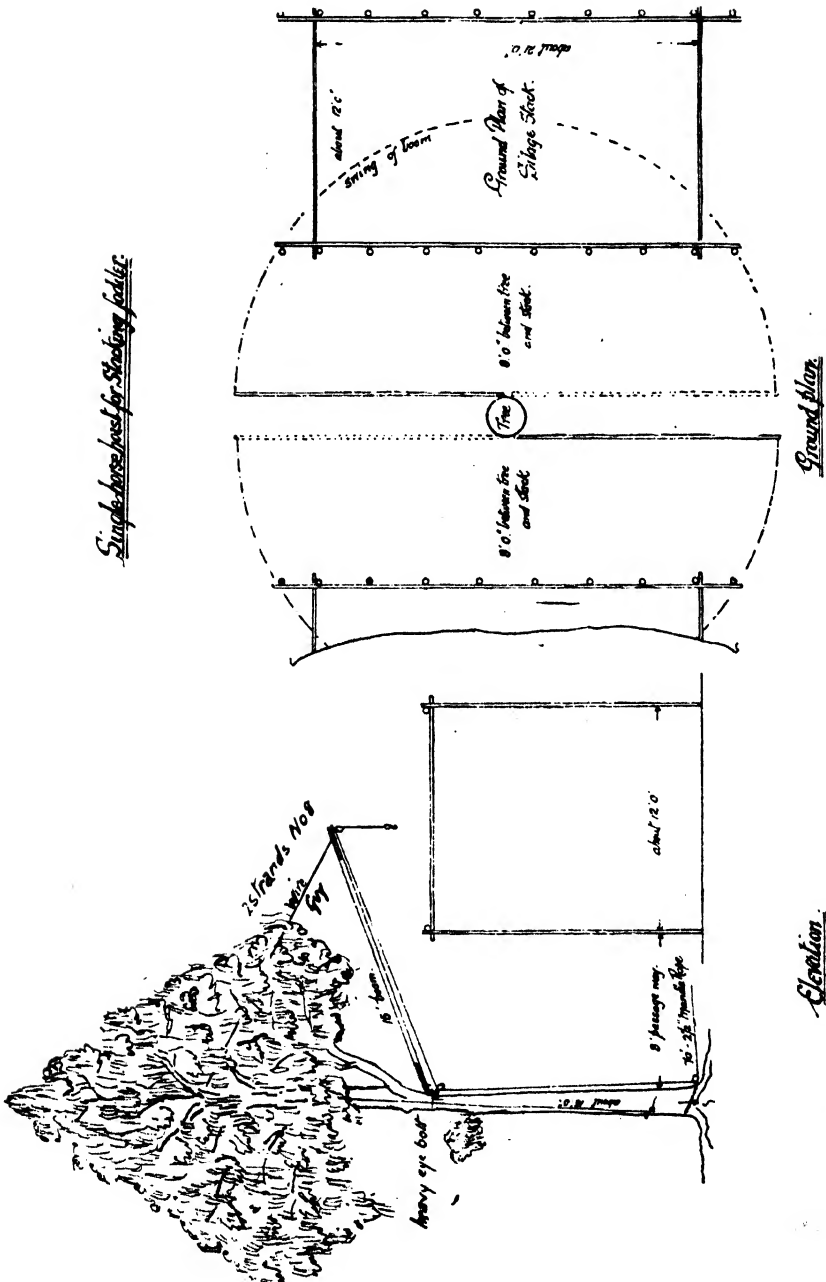


PLATE 85.—SILO STACK CONSTRUCTION AND GROUND PLAN.  
Officers of the Department of Agriculture will supply full particulars as to method and material.

Ration tables are useful guides in feeding, but it must be noted that the analyses of the foodstuffs from which they are computed are averages only—that is to say, the composition of the foodstuff varies according to soil and climate wherein grown, and particularly to the age of growth when harvested.

Another consideration is the cost of a particular ration—whether it pays, when it is compared with the price obtained from the milk produced. But care should be taken that blame for unprofitable feeding is not placed upon the ration, when the fault is due to the cow. Some cows are capable of producing a large amount of milk, other cows are only capable of yielding a small amount of milk, even when supplied with ample well-balanced feed; such poor producers do not pay, and should be culled from the herd.

**The Queensland Dairying Industry is nearly a hundred per cent. co-operatively organised.**

**Ninety-eight per cent. of the butter and ninety-six per cent. of the cheese produced in Queensland are manufactured by co-operative factories under farmer control. No other country in the world, not even Denmark, can show such a great record in farmers' co-operation practically applied.**

A pamphlet entitled "Rations for Dairy Cows," written by Mr. E. H. Gurney, Senior Analyst of the Department of Agriculture and Stock, includes specimen rations which should prove of great value to dairy farmers in securing the maximum production from their individual cows consistent with economical feeding. This pamphlet is available to the dairy farmer, free of charge.

### **A Healthy Cow Delivers the Goods.**

The healthy milch cow, properly cared for, yields milk of first quality. Deterioration, if any, occurs after the dairy farmer takes delivery. In order to produce first quality cream, attention must be given to the production and handling of the milk, and the separation, handling, and delivery of the cream on the factory floor. The quality of the butter produced is dependent upon the quality of the cream, the care, attention, and skill of the buttermaker. The factory manager who desires to place the factory output in the highest grade must be supplied with raw products (milk or cream) of highest quality.

**The best farming methods, the most economic crops, and a steady return on investments are found on every well-managed dairy farm.**

### **Grading.**

Milk or cream grading is the all-important factor in determining the quality of the output. In the grading of milk or cream, or any of its products, it is essential that the grader should have his senses

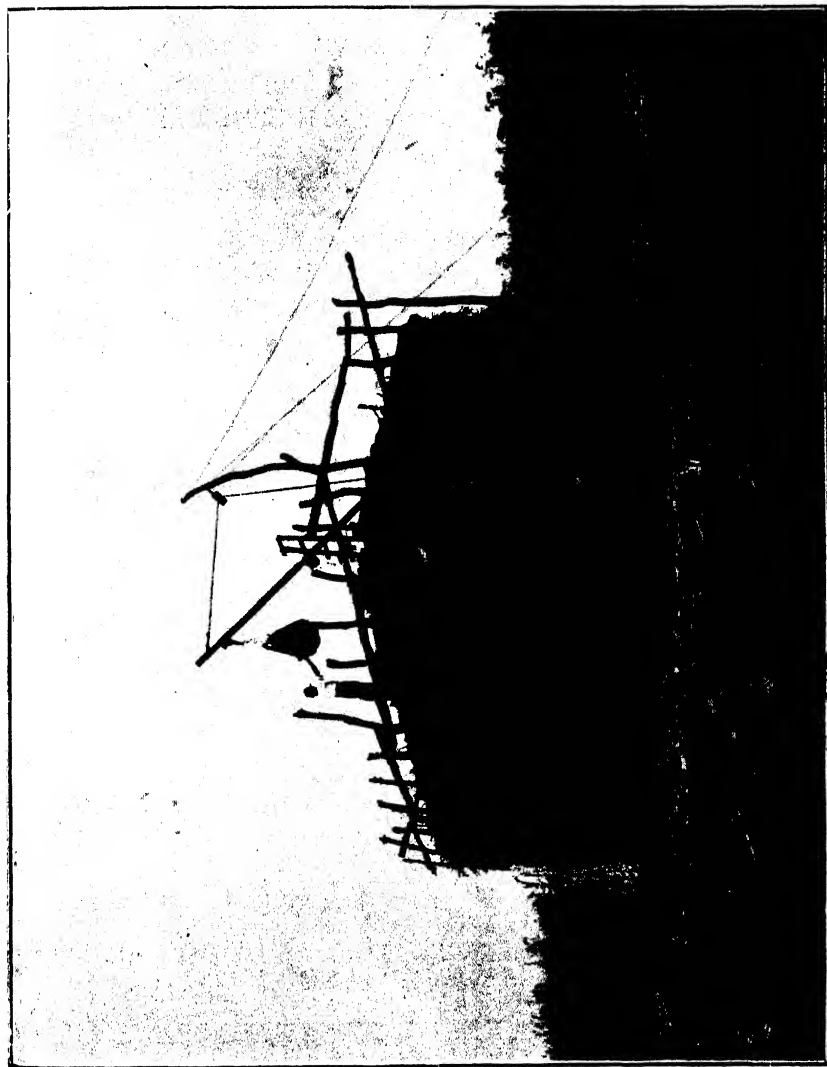


PLATE 86.—A SILAGE STACK IN COURSE OF CONSTRUCTION ON A QUEENSLAND DAIRY FARM. The small cost of the crib timbers and the method of building are obvious. Weighting material (soil) is "whipped" to the top by a single horse-power, as illustrated. This is done before topping off the stack with bush hay.

trained so as to be able to fully appreciate the natural influences of odour and flavour of a first-grade dairy product, be it milk, cream, butter, or cheese. The full natural flavour of carefully produced and well-handled milk and cream, and butter or cheese, appeals to the senses of a trained grader. The cream grader and buttermaker must keep in close touch to secure the best results of their concerted efforts. The position of grader is one of great responsibility. He must carry out his duties expeditiously and exactly.

**Queensland needs more cows of a character that fill the bucket as well as the breeder's eye.**

### **Co-operation Between Farm and Factory.**

The percentage of third class cream is, happily, gradually diminishing, and we look forward to the day when only a high class cream will be supplied to butter factories. To reach that position managers must have the assistance of the dairy farmers, and they must support the farmers in turn. The farmers are not dairying for any other purpose than to make a profit. The majority are always ready to improve their methods and to take advantage of facilities offering, so as to deliver cream of an A1 quality. We must take a wide view of the varied conditions associated with the production, handling, and delivery of cream at factories.

The provisions of the Dairy Produce Act safeguard the production and handling of milk or cream, and when complied with the benefits are manifest. The delivery from farm to factory calls for attention and assistance from every one interested in the transport of milk or cream. Organisation of supplies to factories on the zone system deserves consideration by dairy factory associations. Each factory should draw its supplies from what is regarded as its own geographical area.

### **MANUFACTURE OF DAIRY PRODUCTS.**

All associated with the dairy industry in Queensland may be fairly commended for its progress in recent years, particularly on the manufacturing and marketing sides of the business.

Under present conditions the dairy farmers of this State, constituting with their assistants about 10 per centum of the working population, produce, not only sufficient for our entire home needs, but also contribute the equivalent of £3,000,000 a year to our export trade.

**The good breeder combines bucket capacity with show ring type.**

That the dairy products of this State have reached a high standard of quality is evident by their continued success in open competition with the production of other countries in the world's markets.

Improvement of dairy equipment has been marked within recent years, and most of our factories are of modern construction and equipment, ensuring efficiency in operation.

It has been observed that centralised factories possessing modern manufacturing machinery, and operated under efficient management, have been an important factor in increasing the quality and value of the product.

There is evidence that the establishment of a zonal system, under which central factories would receive cream supplies from the whole of a recognised tributary territory, would eliminate expensive competition and open the way for a complete organisation of cream deliveries.

More cheese is manufactured in Queensland than in any other State of the Commonwealth, and Queensland contributes over 85 per cent. of the total cheese exports from Australia.

**The most and best milk;  
The most and best cream;  
The most and best butter;  
The most and best cheese;  
The most and best profit must come from our dairy cows.**

Gradual improvement in roads and motor transport make it possible for larger centralised cheese factories to operate economically. A higher grade and a more uniform product, and consequently a better price for milk, would result from placing factories of modern design and equipment in central situations.

The attention of many Co-operative Dairy Associations interested in the manufacture of cheese is directed to these possibilities.

Few factories allow a sufficient margin in the prices paid by them for different grades of cream, with the result that the producer is not always impressed with the advantage of spending greater effort in improving the quality of his product.

As a corollary of the present system of factory payments the supplier of high-grade cream is relatively underpaid, or the supplier of inferior quality cream is overpaid. Obviously more encouragement should be given to the careful and efficient dairy farmer than the present short range of cream prices allows.

**The best is proved by test. Dairymen, test your herds!**

### **Factory Buildings and Equipment.**

Modern buildings and equipment are necessary for the manufacture of a high grade product and the keeping down of overhead costs.

The number of new and remodelled factories constructed in recent years is an index of the recognition by factory directors of this fact. New buildings are of brick or concrete construction.



PLATE 87.—INTERIOR OF A QUEENSLAND BUTTER FACTORY.

A factory directorate must move with the times and take advantage of every new improvement in machinery or process.

It is necessary to keep constantly in touch with modern developments in mechanism and methods of management.

### **Methods of Manufacture and Factory Efficiency.**

In making high-grade butter a low temperature is necessary, which means that churns have to turn longer than was formerly the practice. This also entails the provision of additional churns to minimise the hours of work in the factory. Pasteurisation and neutralisation are also claiming more attention, which entails the taking of more time in processing and the provision of extra equipment.

#### **Cows to cull or kill—**

<b>The tubercular cow.</b>	<b>The irregular breeder.</b>
<b>The old cow.</b>	<b>The klicker.</b>
<b>The aborting cow.</b>	<b>The tough milker.</b>
<b>The poor producer.</b>	

Manufacturing methods have improved vastly within the last ten years; and better butter has been made in Queensland factories during the past two years than ever before. There are three main reasons for this marked advance—viz., improvement in the quality of cream; stricter grading of cream; and the application of scientific methods in manufacturing processes.

Keen competition among factories tends in some instances to lower the standard of quality. When cream is classed as second the supplier sometimes resents it, and his resentment is expressed in the transfer of his dealings to another factory, which, to retain his custom, may class his product, which had fallen below the standard set by the factory to which he previously sent his cream, as first grade. This improved classification may, however, be quite justified for the dairyman, under the spur of his resentment and the realisation that greater care is necessary, may make a special effort to improve the quality of his cream. He may not, however, admit that there is an improvement in his product, or feel disposed to acknowledge that the grading at the former factory was right.

**Fodder in the tank means money in the bank.**

Queensland factory methods in general compare favourably with those of other producing States.

Too much second-grade cream is being delivered, and farmers should make a sustained effort to produce and deliver high-grade cream to the factory.

Factory efficiency is generally of a high standard, and the larger number of trained men employed in factories is also an indication of a desire to secure greater technical efficiency.

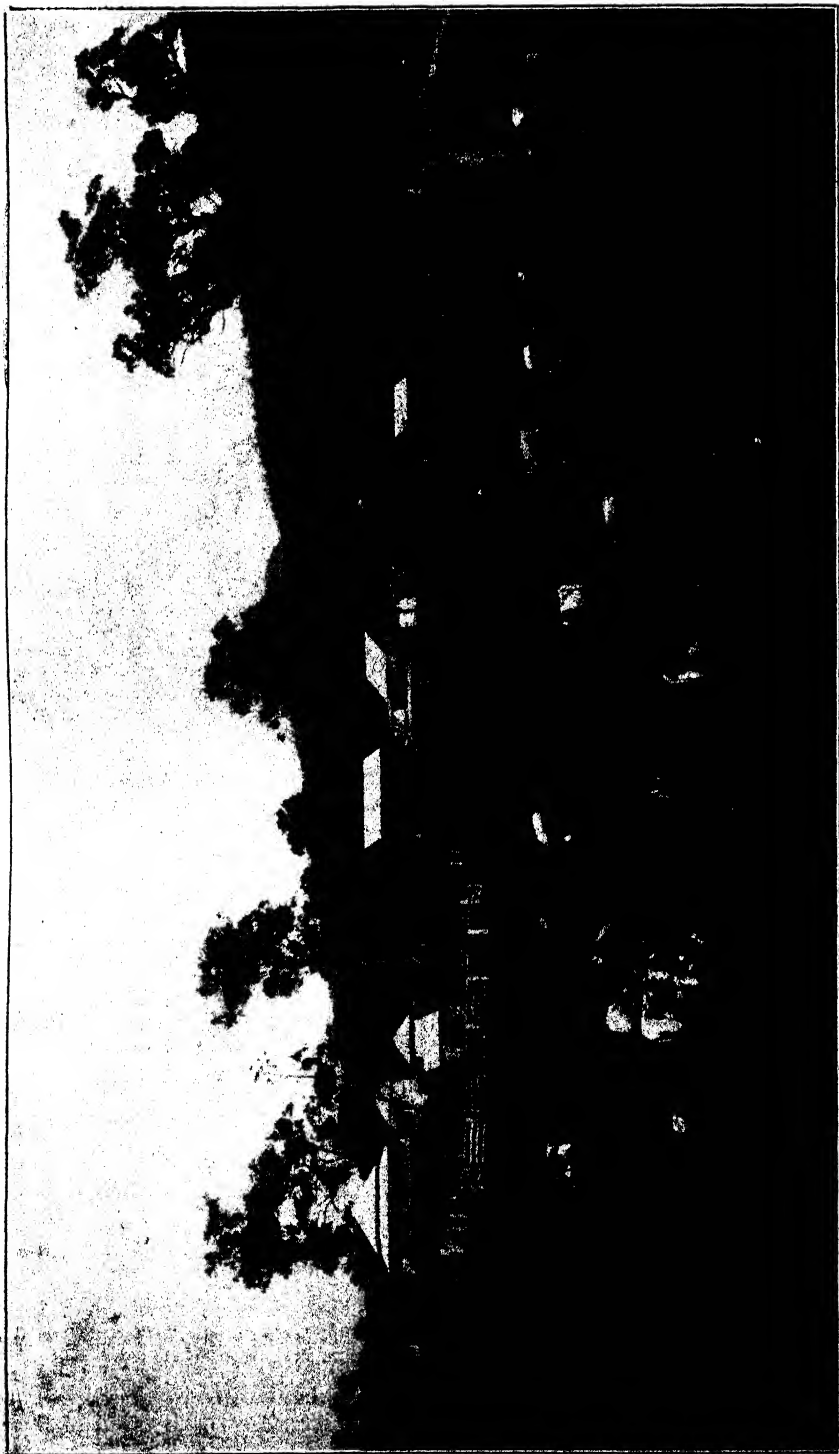


PLATE 88.—A QUEENSLAND DAIRY FARM.

### **Costs of Manufacture.**

Manufacturing costs are reasonable under present conditions, but they could be lessened by a more uniform supply of cream. Volume and regularity of supplies influence costs. For instance, most factories quadruple their output in the flush of the season as compared with their production in the winter months. This means that unless a factory is built and equipped for peak periods efficiency is reduced, for in the slack season more than half the plant cannot be worked to its full capacity.

**Give your cows an opportunity!**  
**Feed them well.**  
**Look after them well.**  
**Rug them in winter.**  
**Milk them clean.**

Costs could be lowered if dairymen adopted a proper system of feeding, which involves the conservation of fodder, the maintenance of a more regular cream supply, and greater uniformity in factory output throughout the year.

The amalgamation of smaller factories would be an advantage in respect to the minimising of production costs. Most of the Queensland butter-making plants are, however, so situated as to ensure a supply big enough to keep the cost of manufacture as low as practically possible.

Present costs of manufacture are reasonable, if the best quality is considered. For instance, lower churning temperatures are employed than ever before. The time of churning is therefore longer, but texture of butter is thereby greatly improved.

Short cuts in cream grading, manufacture, and other essentials can be adopted only at the expense of quality.

To sum up, costs of manufacture would be considerably reduced by creating conditions favourable to a reduction of the difference between maximum and minimum outputs of summer and winter and of dry spells. Better quality raw material would also lower costs. The cost of producing a box of second-grade butter obviously equals that of a box of higher grade.

**Test every cow and find her worth.**  
**We can improve our herds if we breed from high-producing cows selected from families of high-production records.**  
**Clean yards, clean cows, clean hands, clean milk, clean separators, clean cream—all mean best quality butter or cheese.**

## THE IDEAL DAIRY COW.

### Methods of Measurement.

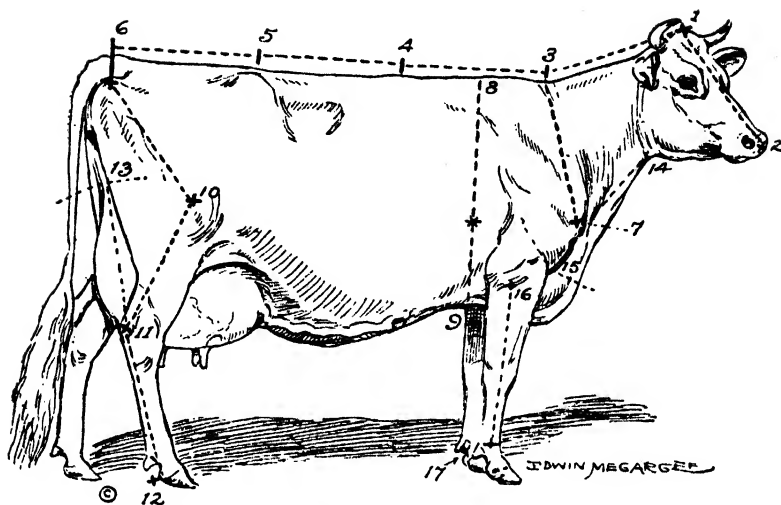


Diagram A. SHOWING METHOD OF APPLYING THE NEW SYSTEM OF MEASUREMENTS.

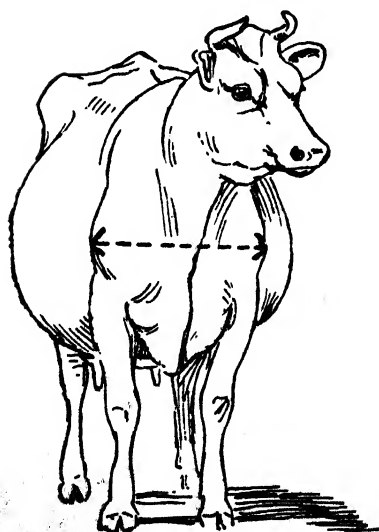


Diagram B. SHOWING MEASUREMENTS FROM SHOULDER POINT TO SHOULDER POINT.

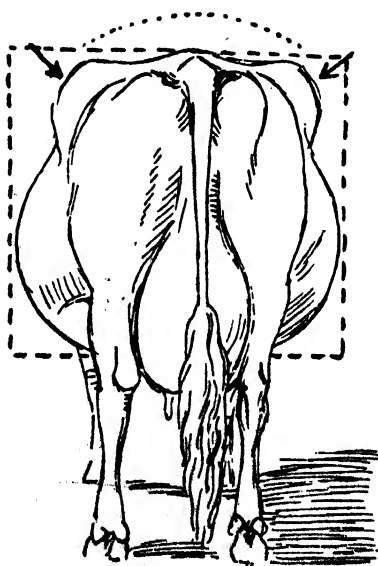


Diagram C. SHOWING MEASUREMENTS FROM HIP TO HIP.

### MARKETING OF DAIRY PRODUCE.

The consumption per head of butter and cheese in the Commonwealth is estimated at 28 lb. of butter and 3½ lb. of cheese per annum. In comparison with these figures the United Kingdom consumption of butter is 15 lb. to 16 lb., and of cheese 7½ lb. to 10 lb. per annum. The production of butter and cheese averages 21,900 tons and 3,800 tons, respectively, per annum, the Queensland consumption being—butter, 9,860 tons; cheese, 1,280 tons per annum. In other words, Queensland produces one-fourth of the total Commonwealth production of butter and almost one-half of the Commonwealth cheese production.

**A silo well filled with suitable fodder gives that feeling of reasonable security so essential in a well-balanced industry.**

It is important to note, however, that in normal seasons Queensland exports two-thirds of its butter and cheese production. This means that the Southern States of Australia have a bigger local consumption proportionate to their production than Queensland. The Australian market is admittedly the most remunerative. The Southern States have some advantage in this regard, and, until the population and consumption of this State have materially increased, the export market will exert a very important influence on the prices secured by Queensland dairymen. While measurable control can be exercised over the local market to bring about a price that would be remunerative to the producer, and yet not unfair to the consumer, it is clear that the necessity of meeting world competition with respect to two-thirds of the butter and cheese production imposes limits upon the relief which organised marketing in Queensland can bring to the dairy farmer.

**Give the cows a chance. Conserve fodder against the dry time.**

Queensland has led all the other States in the matter of organised marketing of dairy products. Ninety-eight per cent. of the butter and about 95 per cent. of the cheese produced in Queensland is manufactured co-operatively, and all manufacturers are alive to the advantages attaching to combination in marketing.

At the request of the cheese producers, compulsory marketing was provided for by State legislation under "*The Cheese Pool Act of 1921*," which came into operation on the 1st January, 1922. On the expiry of the term for which it was constituted under the Cheese Pool Act, the Cheese Pool Board was reconstituted under "*The Primary Products Pools Act of 1922*" (now "*The Primary Producers' Organisation and Marketing Act of 1926*"). Under the Act, a Board is elected comprised of representatives of the dairy farmers engaged in cheese production. The Minister for Agriculture has one representative on the Board. The Board has power to direct and to control the marketing of cheese, but has, however, from its inception, adopted the plan of utilisation of the

existing channels of distribution. The distributors are chosen by the factories, and act as their selling agents, although under license by the Board.

**The careful dairyman thoroughly washes, scalds, and sterilises his machines after every milking.**

**Cleanliness means high quality and big cream cheques.**

### **Organised Marketing of Butter.**

The marketing of butter is controlled under the Primary Producers' Organisation and Marketing Act by the Queensland Butter Board, operating under that statute, the Board having been constituted on the 19th February, 1925. The Board, which is elected by cream suppliers, does not itself undertake marketing, but utilises existing channels of distribution in a somewhat similar manner to that adopted by the Cheese Board, with the exception that, in the case of the Butter Board, the agents are directly appointed by the Board. In practice the Board seeks a nomination from the factories as to the agent which the respective factories desire, and under ordinary circumstances appoints such nominee as a Butter Board agent.

The Australian Butter Stabilisation Scheme came into operation on the 1st January, 1926. Under this scheme provision is made for a levy on all butter manufactured, to provide a bonus on all butter exported. The scheme operates under agreements which are entered into between the dairying interests of each of the butter-producing States.

**Better herds mean better homes, better living, better farms, and better farmers.**

### **Conclusions.**

Having full regard to all the circumstances, it cannot be disputed that the Queensland dairymen have benefited very largely during recent years from the controlled marketing which has been in operation. The following points should be noted:—

1. That, owing to the preponderance of the local production which requires to be exported, no matter how well organised the local market may be, the influence of the weight of the production which has to be exported (two-thirds in the case of butter and more than one-half in the case of cheese) will always depress the average pay to the cream suppliers so long as world values are below the local price.
2. The efficient dairyman is entitled to a fair margin over and above the actual cost of production, which, on the evidence, the fair-minded consumer is prepared to concede.

**A silo means money saved and money made.**

3. There are limits as to the price which organised producers can secure for their products governed by—

- (a) The competition of butter and cheese introduced from elsewhere.
- (b) The competition of other products—*e.g.*, jam, honey, margarine, peanut butter, &c.
- (c) The capacity of the consumer to pay, having regard to the cost of living and the incidence of the basic wage.

It is, therefore, evident that—

- (a) The sphere of organised selling on the local market has been well surveyed, and the producers are well catered for under the existing control system, and little further improvement in returns can reasonably be looked for by dairymen in that direction.
- (b) World prices do not appear likely to improve to any great extent.
- (c) The elimination of unnecessary costs in production, manufacturing, and marketing is highly desirable.
- (d) The adoption of the most modern methods to ensure the manufacture of a uniform product of highest quality is urgently necessary.
- (e) The raising of the standard of production per cow affords, above all other considerations, the greatest possibility of relief to the individual dairyman.
- (f) Improvement in quality of milk and cream leading to the elimination of all grades of raw dairy products that cannot be manufactured into butter or cheese of "Kangaroo" standard.

**A good farm with a good dairy herd, a good farmer and a good family on it, is one of the best things on earth.**

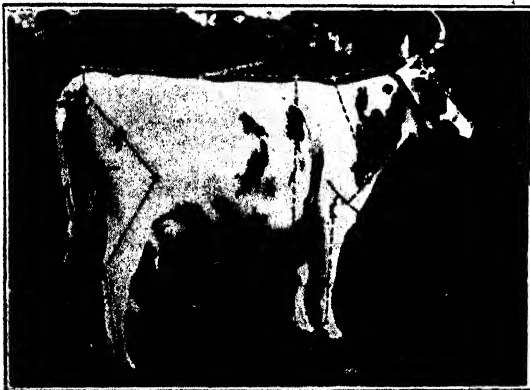


PLATE 90.

Diagram D. THIS AYRSHIRE COW, A QUEENSLAND CHAMPION, IS ALMOST IDEALLY PROPORTIONED.

Diagrams A, B, C (p. 358), and D should be applied to diagram in Bulletin No. 2 D, showing the points of a dairy cow.

## SCHEDULE 1.

## LIST OF BUTTER FACTORIES OPERATING IN QUEENSLAND.

The Atherton Tableland Co-operative Butter and Bacon Company, Limited, Atherton and Malanda.  
 Atherton Tableland Dairy Products, Limited, Malanda.  
 Bundaberg Co-operative Dairy Company, Limited, Bundaberg.  
 The Bushy Creek Co-operative Butter Company, Limited, Julatten, *via* Molloy.  
 Caboolture Co-operative Company, Limited—Factories at Caboolture, Pomona, and Eumundi.  
 The Chinchilla Co-operative Dairy Company, Limited, Chinchilla.  
 Conaghan Brothers, Limited, Rockhampton.  
 Daintree River Development Company, Daintree River, *via* Port Douglas.  
 Dawson Valley Co-operative Company, Limited, Wowan.  
 Dayboro' Co-operative Association, Limited, Dayboro'.  
 The Downs Co-operative Dairy Company, Limited—Factories at Clifton, Dalby, Miles, Toowoomba, Crow's Nest, and Goombungee.  
 The Esk Co-operative Dairy Company, Limited, Esk.  
 Gayndah Co-operative Dairy Company, Limited, Gayndah.  
 The Killarney Dairy Company, Limited, Killarney.  
 Kin Kin Co-operative Dairy Company, Limited, Cooran.  
 The Logan and Albert Co-operative Dairy Company, Limited, Beaudesert.  
 The Maleny Co-operative Dairy Company, Limited, Maleny.  
 The Maryborough Co-operative Dairy Company, Limited—Factories at Biggenden, Kingaroy, Maryborough, and Mundubbera.  
 Nanango Co-operative Dairy Company, Limited, Nanango.  
 The Oakey District Co-operative Butter Company, Limited, Oakey.  
 Pioneer Butter Factory (A. M. Linton), North Ipswich.  
 Pommer Brothers, Ipswich.  
 The Port Curtis Co-operative Butter Company, Limited, Gladstone.  
 Queensland Agricultural High School and College, Gatton.  
 Queensland Farmers' Co-operative Company, Limited—Factories at Booval, Boonah, Grantham, and Laidley.  
 The Rockhampton District Dairy Company, Limited, Rockhampton.  
 Roma Co-operative Dairy Company, Limited, Roma.  
 The South Burnett Co-operative Dairy Company, Limited, Murgon.  
 The Southern Queensland Dairy Company, Limited, Kingston.  
 The Stanley River Co-operative Company, Limited, Woodford.  
 Warwick Butter and Dairying Company, Limited—Factories at Allora, Goondiwindi, Mill Hill, Warwick, and Texas.  
 Wide Bay Co-operative Dairy Company, Limited—Factories at Cooroy and Gympie.  
 The Evelyn Tableland Dairy Association, Limited, Ravenshoe.

## CONDENSED MILK FACTORIES.

Nestle's, Toogoolawah.

## SCHEDULE 2.

## LIST OF CHEESE FACTORIES IN QUEENSLAND.

Aubigny Co-operative Dairy Company, Limited, Aubigny, *via* Oakey.  
 Austral Dairy Company, Mount Sibley road, *via* Greenmount.  
 Biddeston Co-operative Dairy Company, Limited, Biddeston, *via* Oakey.  
 Captains Mountain Co-operative Dairy Company, Limited, Milmerran.  
 Coalstoun Lakes Cheese Factory, *via* Biggenden.  
 Cooranga North Co-operative Cheese Association, Limited, *via* Bell.  
 The Downs Co-operative Dairy Company, Limited—Factories at Hodgson Vale, Lily vale, Gowrie Junction, Koondaii, *via* Bell, Westbrook, Jondaryan, Boodua.  
 Dundarra Co-operative Cheese Company, Limited, *via* Biggenden.  
 Felton Co-operative Dairy Company, Limited, *via* Cambooya.  
 Greenmount Dairy Company, Limited, Greenmount.  
 Hitchcock, C. M., Kedron Park road, Woolloowin—Factories at Cooby, Meringandan, and Gomoran.  
 Irongate Co-operative Dairy Company, Limited, *via* Pittsworth.  
 I.K.L. Cheese Factory, Greenmount East.  
 Kooroongarra Co-operative Dairy Company, Limited, Kooroongarra.  
 Kumbia Cheese Factory, Emu Creek, *via* Crow's Nest.  
 Leyburn Dairy Company, Limited, Leyburn.

Lowood Cheese Factory, Lowood.

Malling Co-operative Cheese Society, Limited, *via* Maclagan.

The Maryborough Co-operative Dairy Company, Limited—Factories at Branch Creek, *via* Gayndah, and Brooklands, *via* Kingaroy.

Maclagan Valley Co-operative Dairy Company, Limited, Maclagan—Factories at Maclagan, Maclagan North, Rangemore, and Kulpi.

Merrimac Cheese Factory, *via* Worongary.

Moola Co-operative Dairy Association, Limited, *via* Kaimkillenbun.

The Mount Sibley Co-operative Dairy Company, Limited, Ascot, *via* Greenmount.

Mount Tyson Farmers' Co-operative Dairy Company, Limited, Mount Tyson, *via* Oakey.

Oakey District Co-operative Butter Company, Limited, Oakey—Factories at Kelvinhaugh, *via* Oakey, and Crosshill, *via* Oakey.

The Pittsworth Dairy Company, Limited, Pittsworth—Factories at Brookstead Linthorpe, Yarranlea, Springside, Scrubby Mountain, and Pittsworth.

Queensland Agricultural High School and College, Gatton.

Queensland Farmers' Co-operative Company, Limited, Rosevale, *via* Rosewood.

The Ramsay Dairy Company, Limited, Ramsay, *via* Cambooya.

Rocky Creek Co-operative Dairy Company, Limited, Rocky Creek, *via* Milmerran.

Rockview Dairy Association, Limited, Southbrook.

Rosalie Cheese Factory—Branches at Jondaryan and Kingsthorpe.

Rosemount Cheese Factory, Brymaroo.

W. Smith, Yangan Cheese Factory, Yangan.

Southbrook Co-operative Dairy Company, Limited, Southbrook.

G. V. Soutter, Silvermist Cheese Factory, Glenallyn, Malanda.

Standard Dairy Company, Limited, Wellcamp.

G. W. Stanley, Rodger's Creek, *via* Warwick.

The Sugarloaf Dairy Company, Limited, Sugarloaf, *via* Cambooya.

Sunnyvale Co-operative Cheese Company, Limited, Sunnyvale, *via* Bell.

Wallace, N. J., Peeramoon, North Queensland.

The Warwick Butter and Dairying Company, Limited—Factories at Elbow Valley, Talgai, Bony Mountain, Victoria Hill, Pratten, Lord John Swamp, Greymare, all *via* Warwick.

Watt's Dairy Company, Watt's Siding.

Waverley Cheese Factory, Irvingdale, *via* Bowenville (McLennan Brothers).

Downs Co-operative Dairy Company, Wyreema.

Woodleigh Cheese Factory (Thomas Dare), Narko, Cooyar Line.

Quinalow Dairy Association, Limited, *via* Jondaryan.

Yargullen Co-operative Dairy Company, Limited, Yargullen, *via* Oakey.

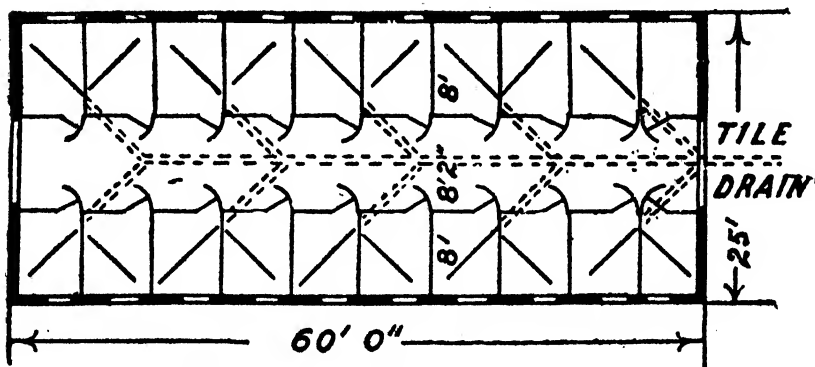
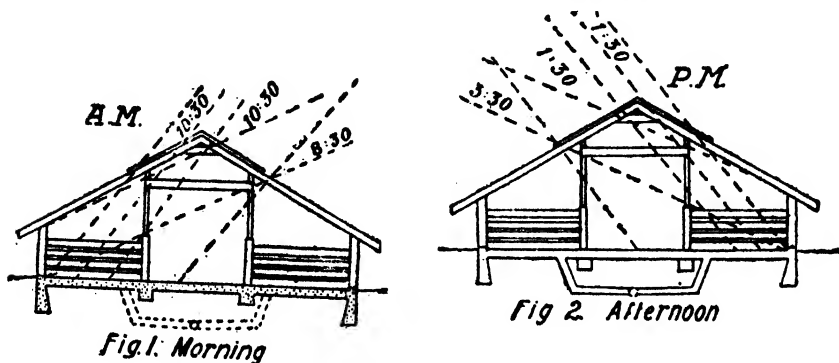


Photo.: Miss J. Easton.]

PLATE 91.—THE OPEN ROAD THROUGH LUCERNE FIELDS ON COOCHIN COOCHIN, SOUTHERN QUEENSLAND.

### SUNLIGHT PIGGERY.

In reply to a request, plans of a piggery, previously given in "The Australasian," are reproduced. This "sunlight piggery" is a low, roomy structure, with its walls, floors, and partition posts built of hollow brick and concrete, while its upper framing and roof are of glass and of wood covered with asbestos roofing. The inside partitions are usually of wood, although they have been made of steel. These partitions are removable, being slipped into grooves in the sides of the concrete partition posts. All the doors are framed with reinforced concrete. The floor plan is quite convertible to suit the local requirements, having been built with a narrow feed alley, with a driveway with pens on each side, or with three rows of pens and two narrow feed alleys. However, the one feature of the house that makes it different from others is the fact that it stands with its ridge-pole running north and south, and that on each side of the ridge-pole there is a wide area covered with skylight sashes. Every part of the house is sterilised by Nature's method once every sunshiny day.



**Fig. 3. Plan**

In the early morning the sunlight comes through the sash windows on the east side of the roof, strikes the west wall, and, as the sun slowly rises, creeps down to and across the bedding and feed trough, until at noon the sun shines into both rows of the sash. In the afternoon the operation is reversed, and the east half of the house is sterilised. The south pen, which does not get full benefit of the roof windows, is provided for by windows in the end wall. For ventilation, these roof sashes are hinged, so that they may be raised and fastened up. The low, overhanging eaves furnish outside protection for the swine when the weather is bad, and the brick and concrete construction, along with the low roof, keep the building warm in winter. Adequate provision for drainage of the concrete floor makes it impossible for the building to become wet or sloppy inside. From a sanitary standpoint, this hoghouse approaches perfection. It is warm, dry, light, easily ventilated, conveniently arranged, and permanent. Yet the cost is not excessive. The house shown is 25 feet by 60 feet in size, and cost when complete just £160. This arrangement does away with the necessity for sun-shutters. In summer time the sun may pour in too strongly in the middle of the day, but spring blinds will provide sufficient protection.—"The Australasian."

# The Most Reliable Concentrated Foods on the Market !

## **Bacal Products**

*The basis of these products is Cottonseed and Soya Bean Meal scientifically blended with other nutritive ingredients to form a perfectly balanced concentrate.*

### **Bacal Cottonseed Meal**

PRICE £11 PER TON

A very firm favourite with the Dairyman. We have numerous testimonials from satisfied clients.

### **Bacal Feed Meal**

PRICE £11 PER TON

For dairy cows. A splendidly-balanced feed made from Cottonseed Meal, Soya Beans, Maize, Peanuts, & Wheat.

### **Bacal Sheep Cubes**

PRICE £12 10s. PER TON

Thousands of tons fed to Queensland flocks during 1927.

### **Bacal Poultry Food**

PRICE £14 10s. PER TON

The egg-producing concentrate.

### **Bacal Salt Lick**

PRICE £13 10s. PER TON

The ideal stock conditioner.

ALL QUOTATIONS ARE F.O.R. WHINSTANES

---

*Manufactured by*

**British Australian Cotton Assoc. Ltd.**  
**Whinstanes, Brisbane**

*and obtainable from the Sole Distributors—*

**Arthur Vale & Co. Pty. Ltd.**

**Union Bank Chambers, Queen St., Brisbane**

*also from all Produce Houses and Merchants.*

---

**We will be pleased to forward you pamphlets and prices at your request.**

# Make your own Cough Mixture

**Costs 2/- saves £'s.**

To save much money by making a family supply of the best cough and influenza remedy, order from your chemist or store a two-shilling bottle of concentrated Heenzo. By adding the Heenzo to sweetened water, you will have a supply EQUAL to eight ordinary sized bottles (about £1's worth) of the best ready-made-up remedies for chest and throat ailments. You will be delighted with the speedy way HEENZ0 soothes sore throats, eases the chest, and banishes coughs and colds.



M'dme Scotney.

## Read what users say about **HEENZ0**

*M'dme Evelyn Scotney*, one of the world's greatest Sopranos, writes:—"I regard Heenzo as an ideal remedy for coughs and colds. Its delicate flavour and pronounced tonic action on the vocal chords win the approbation of the user."

*Sir Harry Lauder* writes:—"I have tried Heenzo and found it good."

*The Antarctic Exploration Expedition*.—"We proved Heenzo an invaluable remedy for chest and throat ailments under the severest Antarctic conditions."

*Miss Gladys Moncrieff*.—"Heenzo is a blessing to those who suffer from chest and throat ailments."

# **HEENZ0**

*is equally good for young and old in the  
treatment of*

**Coughs, Colds, 'Flu  
Croup, Bronchitis, & Whooping Cough**

## ROYAL NATIONAL EXHIBITION.

### ADDITIONAL AWARDS.

Following are details of some of the last Brisbane Show Awards, which are of especial interest to farmers:—

#### BUTTER AND CHEESE CONTESTS.

The prize for fresh butter for local consumption was awarded to the Downs Co-operative Dairy Association's Clifton factory.

Under the conditions laid down for one of the salted classes, and also in one of the unsalted classes, two boxes were necessary to complete the entries, one of which was despatched to London, where it will be judged as soon as possible after arrival. The prizes in these two contests will be awarded to the factories whose aggregate of points awarded in London and at the Exhibition are the highest. Mr. H. Day, of the Downs Co-operative Dairy Association's factory at Toowoomba, secured the prize in the butter-makers' competition, donated by the Brisbane Newspaper Company, Limited.

#### FRESH BUTTER FOR LOCAL CONSUMPTION.

One box, containing not less than 56 lb., factory made.

	Flavour.	Texture.	Colour.	Salting.	Packing and Finish.	Total.
Possible points .. .. .	65	20	7	4	4	100
Downs Co-operative Dairy Association, Dalby .. .. .	61½	20	6½	4	3½	95½
Downs Co-operative Dairy Association, Clifton .. .. .	61	20	6½	4	3½	95
Wide Bay Co-operative Dairy Association, Gympie .. .. .	60	19½	7	4	4	94½
Downs Co-operative Dairy Association, Toowoomba .. .. .	58½	20	7	4	3½	93
Maleny Co-operative Dairy Association .. .. .	59	19½	7	4	3½	93
Queensland Farmers' Co-operative Association, Booval .. .. .	58	20	7	4	4	93
Chinchilla Co-operative Dairy Association .. .. .	58	20	7	4	3½	92½
Alstonville Co-operative Dairy Association .. .. .	58	19½	6½	4	4	92
Caboolture Co-operative Dairy Association, Caboolture .. .. .	58	19½	6½	4	4	92
Downs Co-operative Dairy Association, Goombungee .. .. .	58	19½	7	4	3½	92
Caboolture Co-operative Dairy Association, Eumundi .. .. .	57½	19½	7	4	3½	91½
Maryborough Co-operative Dairy Association, Kingaroy .. .. .	57	20	7	4	3½	91½
Muswellbrook Co-operative Dairy Association .. .. .	57	19½	7	4	4	91½
Oakey District Co-operative Butter Association .. .. .	57½	19½	7	4	3½	91½
Queensland Farmers' Co-operative Association, Boonah .. .. .	56½	20	7	4	4	91½
Queensland Farmers' Co-operative Association, Grantham .. .. .	57½	19½	6½	4	4	91½
Queensland Farmers' Co-operative Association, Laidley .. .. .	57½	19½	6½	4	4	91½
Singleton Central Co-operative Dairy Association .. .. .	57	19½	7	4	4	91½
Warwick Co-operative Dairy Association, Allora .. .. .	57½	19½	6½	4	4	91½
Downs Co-operative Dairy Association, Miles .. .. .	57½	19½	6½	4	3½	91
Esk Co-operative Dairy Association .. .. .	57	20	6	4	4	91
Warwick Co-operative Dairy Association, Mill Hill .. .. .	57	19½	7	4	3½	91
Downs Co-operative Dairy Association, Crow's Nest .. .. .	57	19½	6½	4	3½	90½



PLATE 92.—NORTHERN TABLELANDS OF NEW SOUTH WALES DISTRICT EXHIBIT—FIRST PRIZE "A" GRADE,  
DISTRICT EXHIBIT COMPETITION, ROYAL NATIONAL ASSOCIATION SHOW, 1928.

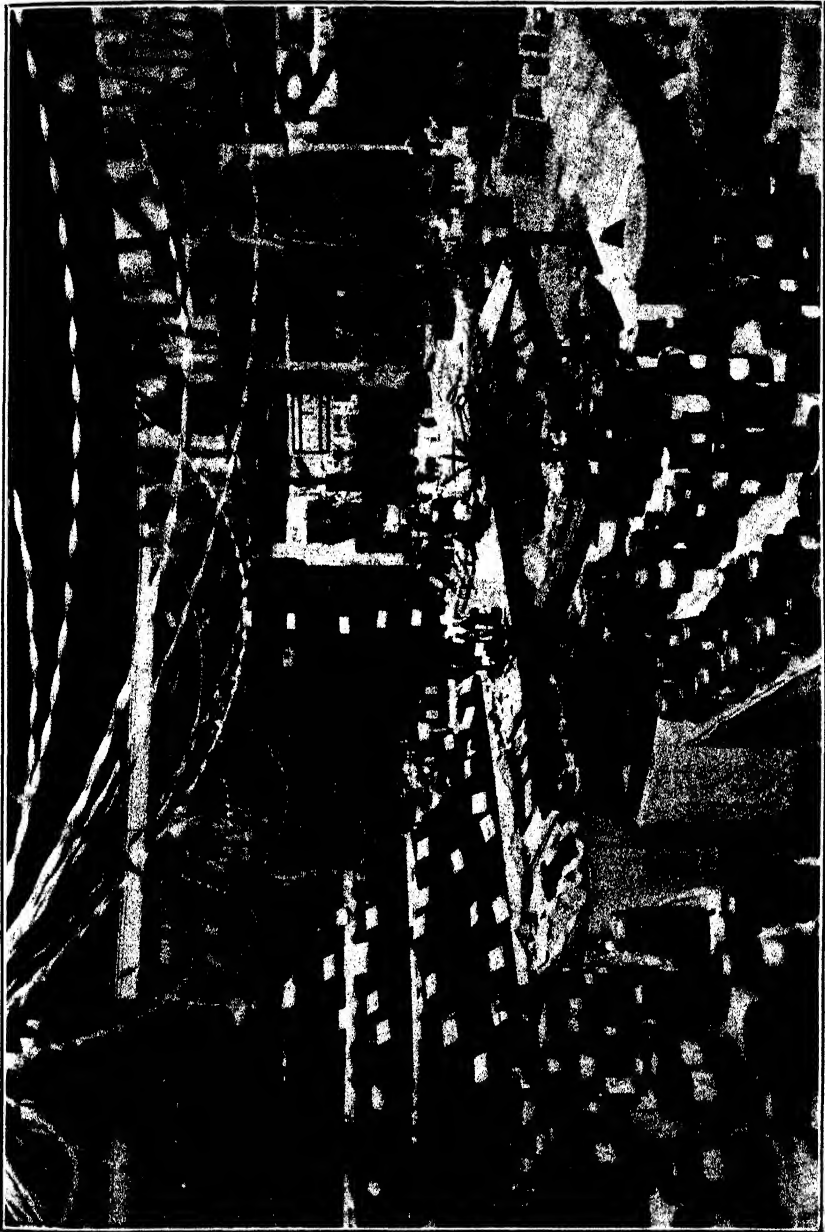


PLATE 93—WIDE BAY AND BURNETT DISTRICT EXHIBIT—SECOND PRIZE IN "A" GRADE, DISTRICT EXHIBIT COMPETITION, ROYAL NATIONAL ASSOCIATION SHOW, 1928.

**BUTTER AND CHEESE CONTESTS—continued.**  
**FRESH BUTTER FOR LOCAL CONSUMPTION—continued.**

	Flavour.	Texture.	Colour.	Salting.	Packing and Finish.	Total.
Possible points .. .. .	65	20	7	4	4	100
Maryborough Co-operative Dairy Association, Biggenden .. .. .	57	19½	6½	4	3½	90½
Maryborough Co-operative Dairy Association, Maryborough .. .. .	57½	19	6½	4	3½	90½
Nanango Co-operative Dairy Association ..	57	19½	6½	4	3½	90½
Kin Kin Co-operative Dairy Association	56½	19½	6½	4	4	90½
Caboolture Co-operative Dairy Association, Pomona .. .. .	56½	19	6½	4	4	90
Logan and Albert Co-operative Dairy Association .. .. .	56½	19	6½	4	4	90
Maryborough Co-operative Dairy Association, Mundubbera .. .. .	56½	19½	6½	4	3½	90
Gayndah Co-operative Dairy Association	56	19	6½	4	3½	89
Daintree River Dairy Association ..	54½	19	6½	4	3½	87½

**BUTTER-MAKERS' COMPETITION.**

One box, not less than 56 lb.; no preservative other than salt permitted.

H. Day, Toowoomba .. .. .	61½	20	6½	4	3½	95½
J. C. Dare, Goombungee .. .. .	60½	20	7	4	3½	95
N. Singleton, Woodford .. .. .	60	19½	7	4	4	94½
N. Smythe, Eumundi .. .. .	58	19½	7	4	3½	93
J. C. Irwin, Clifton .. .. .	58	20	6½	4	3½	93
K. Spoor, Mundubbera .. .. .	58½	20	7	4	3½	93
W. J. Heiner, Kingaroy .. .. .	58	20	7	4	3½	92½
H. L. Pretty, Singleton .. .. .	58	19½	7	4	4	92½
W. Stone, Dalby .. .. .	58	20	7	4	3½	92½
Esk Co-operative Dairy Association, nominee .. .. .	57	20	7	4	4	92
A. W. Cork, Casino .. .. .	57½	20	6½	4	3½	91½
R. Ferguson, Grantham .. .. .	57	20	6½	4	4	91½
R. E. Rose, Booval .. .. .	57	19½	7	4	4	91½
G. Tomlinson, Boonah .. .. .	56½	20	7	4	4	91½
J. G. White, Gympie .. .. .	57	19½	7	4	4	91½
W. Byrne, Miles .. .. .	57½	19½	6½	4	3½	91
H. Cherry, Oakey .. .. .	57½	19½	6½	4	4	91
Nowra Dairy Co., nominee .. .. .	57	19½	6½	4	4	91
M. J. Flynn, Gayndah .. .. .	56½	19½	6½	4	3½	90
H. J. Neill, Maleny .. .. .	56½	19½	6½	4	3½	90
G. Pitt, Laidley .. .. .	56	19½	7	4	3½	90
R. Saunders, Caboolture .. .. .	56	19½	6½	4	4	90
Chinchilla Co-operative Dairy Association, nominee .. .. .	56½	19½	6½	4	3½	90
J. H. Bretz, Crow's Nest .. .. .	56½	19	6½	4	3½	89½
R. C. Eggins, Casino .. .. .	56½	19½	6½	4	4	89½
T. Spence, Beaudesert .. .. .	56½	19	6	4	4	89½
G. Bubke, Biggenden .. .. .	56½	19	6	4	3½	89
D. J. Forrest, Muswellbrook .. .. .	55½	19	6½	4	4	89
A. Veiritz, Pomona .. .. .	56	19	6	4	4	89
C. T. Warner, Maryborough .. .. .	55½	19½	6½	4	3½	89
K. Hargreaves, Daintree .. .. .	55	19	6	4	3½	87½

**EVEN QUALITY.**

**JUDGE'S COMMENTS.**

"The outstanding feature in the butter classes judged at this show is the evenness of quality throughout, but compared with the exhibits last year it is hardly up to that high standard, although the prize awards, I think, stand out in point of excellence, despite a slight lack of rich character flavour," said Mr. G. S. Stening (judge of butter) in the course of an interview.

Possibly, he added, the prolific season experienced in Queensland had been a contributing factor, but exhibitors were to be congratulated on improvement very noticeable in manufacture. Processing and pasteurisation of cream were details that had received very strict attention, and in the majority of exhibits had been carried out efficiently, but there was one detail in manufacture that he would again draw attention to. That was lower churning temperature and longer working time. That would produce that tough, waxy texture so desirable, especially in export butter, for when it was considered that texture played such an important part in the keeping quality of butter it was essential that this detail should be given more attention.

Mr. Stening observed that so far the results of the Orient Jubilee Competition were not available, and hence the prizes for aggregate could not be awarded, as it provided for the aggregate of points in all classes, but it was hoped that the result, which was dependent upon the judge of butter in London, would not be long delayed.

In class 1382, continued the judge, the Queensland Farmers' Co-operative Association, Grantham, had been placed first with a very fine sample, being excellently made, and of delicate flavour. The Downs Co-operative Dairy Association, Toowoomba, and the Downs Co-operative Association, Goombungee, were second and third not very far behind the first prize-winner, and in those two it would be noticed when the points cards were studied that half a point in each had been deducted for finish, due solely to the want of an edging around the honey-combed surface which imparted a more attractive and finished appearance to the butter. In class 1379 the Downs Co-operative, Toowoomba, had been placed first, with Nowra Dairy Company, New South Wales, second, and Downs Co-operative Association, Clifton, third. These three were very fine exhibits, and would be place-getters at any show.

In the fresh classes of butter for local consumption the Downs Co-operative, Dalby, had been placed first, Clifton second, and Wide Bay third. In the butter-makers' class H. Day had won, C. Dair had been second, and Norman Singleton third. All these were fine exhibits, but remarks about manufacture applied very forcibly in these fresh classes. Knowing as he did the difficulties encountered with winter manufacture because of lower acid content of the cream, managers would be well advised to study closely the factors of churning temperature and working, for many of the butters exhibited in these two classes were inclined to be greasy and open in texture, and had lost points accordingly.

#### EXPORT BUTTER.

Honours in the export butter classes were this year divided between the Downs Co-operative Dairy Association, Limited, and the Queensland Farmers' Co-operative Association, Limited. Competition was keen, only half-points separating the place-getters in each of the two classes judged. Details:—

#### BUTTER FOR EXPORT.

Six weeks' storage, salted, one box of not less than 56 lb.; manufactured in Queensland from pasteurised cream, suitable for table use in Britain.

	Flavour	Texture.	Colour.	Saltng.	Packing and Finish.	Total.
Possible points .. .. .	65	20	7	4	4	100
Queensland Farmers' Co-operative Association, Grantham .. .. .	60	20	7	4	4	95
Downs Co-operative Dairy Association, Toowoomba .. .. .	60	20	7	4	3½	94½
Downs Co-operative Dairy Association, Goombungee .. .. .	59½	20	7	4	3½	94
Logan and Albert Co-operative Dairy Association .. .. .	58½	20	7	4	4	93½
Queensland Farmers' Co-operative Association, Laidley .. .. .	58½	20	7	4	4	93½

BUTTER FOR EXPORT—*continued.*

Six weeks' storage, salted, one box of not less than 56 lb. ; manufactured in Queensland from pasteurised cream, suitable for table use in Britain—*continued.*

	Flavour.	Texture.	Colour.	Salting.	Packing and Finish.	Total.
Possible points .. .. .	65	20	7	4	4	100
Stanley River Co-operative Association ..	58½	20	7	4	4	93½
Warwick Co-operative Dairy Association, Mill Hill .. .. .	58½	20	7	4	4	93½
Caboolture Co-operative Association, Eumundi .. .. .	59	19½	7	4	3½	93
Downs Co-operative Dairy Association, Clifton .. .. .	58	20	7	4	4	93
Downs Co-operative Dairy Association, Dalby .. .. .	58½	20	7	4	3½	93
Esk Co-operative Dairy Association ..	58	20	7	4	4	93
Wide Bay Co-operative Dairy Association, Gympie .. .. .	58	20	7	4	4	93
Downs Co-operative Dairy Association, Miles .. .. .	58½	20	7	4	3½	93½
Dayboro' Co-operative Dairy Association ..	58	20	7	3½	4	92½
Downs Co-operative Dairy Association, Crow's Nest .. .. .	58	20	7	4	3½	92½
Maryborough Co-operative Dairy Association, Kingaroy .. .. .	58	20	7	4	3½	92
Oakey District Co-operative Butter Association .. .. .	58½	20	6½	4	3½	92½
Queensland Farmers' Co-operative Association, Booval .. .. .	58	20	7	3½	4	92½
Maleny Co-operative Dairy Association ..	58	19½	6½	4	3½	91
Caboolture Co-operative Association, Pomona .. .. .	57	19½	6½	4	4	91
Gayndah Co-operative Dairy Association ..	57½	19½	7	4	3	91
Nanango Co-operative Dairy Association ..	58	19	6½	4	3½	91
Maryborough Co-operative Dairy Association, Biggenden .. .. .	57½	19	6	4	4	90½
Maryborough Co-operative Dairy Association, Mundubbera .. .. .	57½	19½	6½	4	3½	90½
Warwick Co-operative Dairy Association, Allora .. .. .	57	19	6½	4	4	90½
Caboolture Co-operative Association, Caboolture .. .. .	58	19	6	3½	3½	90
Maryborough Co-operative Dairy Association, Maryborough .. .. .	56	19½	7	4	3½	90
Queensland Farmers' Co-operative Association, Boonah .. .. .	57	19½	6½	3	3½	89½

Thirty days' storage, one box of not less than 56 lb.

Downs Co-operative Dairy Association, Toowoomba .. .. .	60½	20	7	4	3½	95
Nowra Dairy Co. .. .. .	59½	20	7	4	4	94½
Downs Co-operative Dairy Association, Clifton .. .. .	59	20	7	4	4	94
Singleton Central Co-operative Dairy Association .. .. .	58½	20	7	4	4	90½
Queensland Farmers' Co-operative Association, Grantham .. .. .	58½	20	7	4	4	93½
Muswellbrook Dairy Co. .. .. .	57½	20	7	4	3½	93
Downs Co-operative Dairy Association, Dalby .. .. .	58½	20	7	4	3½	93

## BUTTER FOR EXPORT—continued.

Thirty days' storage, one box of not less than 56 lb.—continued.

	Flavour.	Texture.	Colour.	Salting.	Packing and Finish.	Total.
Possible points .. .. .	65	20	7	4	4	100
Maryborough Co-operative Dairy Association, Kingaroy .. .. .	58	20	7	4	4	93
Maryborough Co-operative Dairy Association, Mundubbera .. .. .	57½	20	7	4	3½	93
Oakey District Co-operative Butter Association .. .. .	58½	20	7	4	3½	93
Queensland Farmers' Co-operative Association, Laidley .. .. .	58	20	7	4	4	93
Warwick Co-operative Dairy Association, Mill Hill .. .. .	58½	20	7	4	3½	93
Wide Bay Co-operative Dairy Association, Gympie .. .. .	58	20	7	4	4	93
Downs Co-operative Dairy Association, Goombungee .. .. .	58	20	7	4	3½	92½
Dayboro' Co-operative Dairy Association .. .. .	58	20	7	4	3½	92½
Downs Co-operative Dairy Association, Crow's Nest .. .. .	58	20	7	4	3½	92½
Downs Co-operative Dairy Association, Miles .. .. .	58	20	7	4	3½	92½
Queensland Farmers' Co-operative Association, Booval .. .. .	57½	20	7	4	4	92½
Alstonville Co-operative Dairy Association .. .. .	57½	19½	6½	4	4	91½
Queensland Farmers' Co-operative Association, Boonah .. .. .	57½	19½	7	4	3½	91½
Caboolture Co-operative Association, Eumundi .. .. .	57	19½	7	4	3½	91
Casino Co-operative Dairy Society .. .. .	57½	19½	6½	4	3½	91
Downs Co-operative Dairy Association, Miles .. .. .	57	19½	7	4	3½	91
Logan and Albert Co-operative Dairy Association .. .. .	57	19½	7	4	3½	91
Maleny Co-operative Dairy Association .. .. .	57	19½	7	4	3½	91
Maryborough Co-operative Dairy Association, Maryborough .. .. .	57	19½	6½	4	3½	90½
Stanley River Co-operative Association .. .. .	56	19½	7	4	4	90½
Gayndah Co-operative Dairy Association .. .. .	57	19½	6½	4	3½	90½
Esk Co-operative Association .. .. .	56½	19½	6½	4	3½	90
Maryborough Co-operative Dairy Association, Biggenden .. .. .	56½	19½	6½	4	3½	90
Caboolture Co-operative Association, Caboolture .. .. .	56½	19	6	4	4	89½
Nanango Co-operative Dairy Association .. .. .	56	19	6½	4	3½	89
Caboolture Co-operative Association, Pomona .. .. .	55	19	6	3½	4	87½

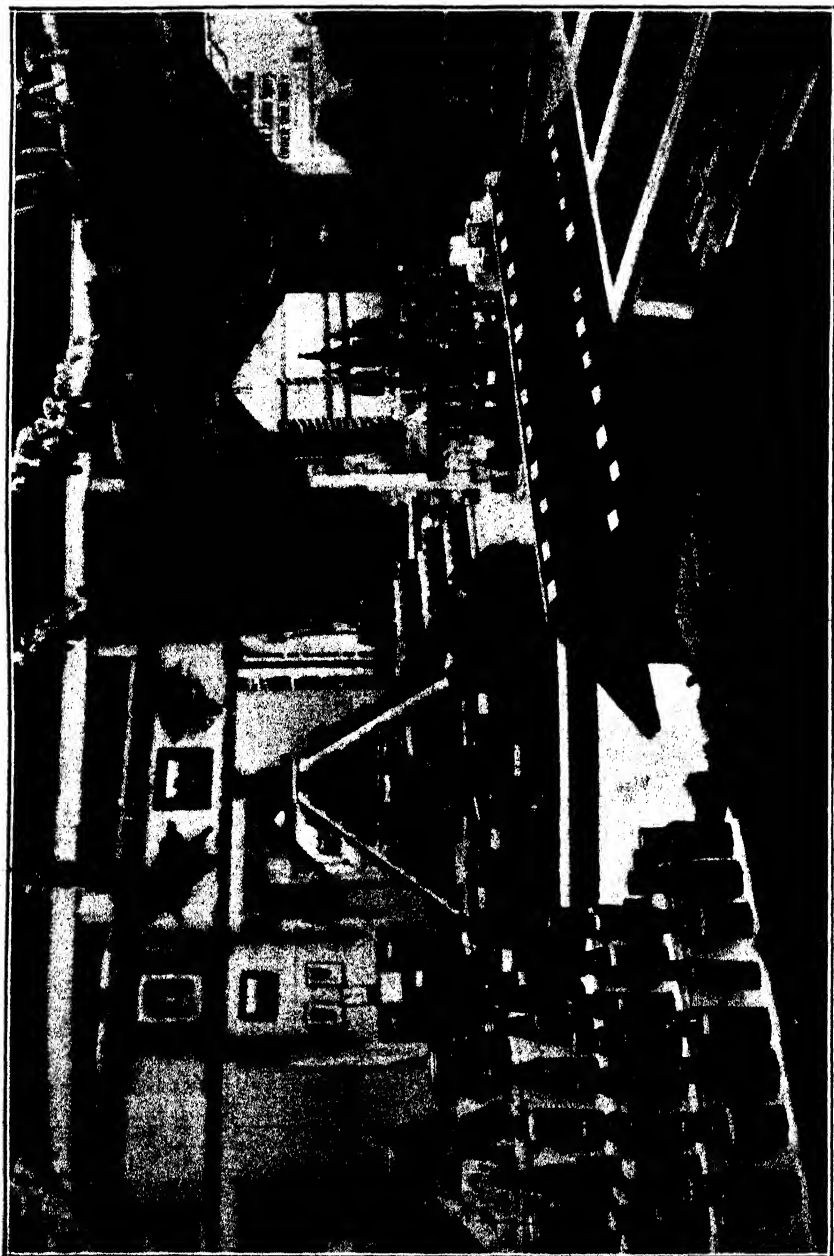


PLATE 94.—BRISBANE VALLEY DISTRICT EXHIBIT.  
1st Prize "B" Grade, District Exhibit Competition, Royal National Association's Show, 1928.

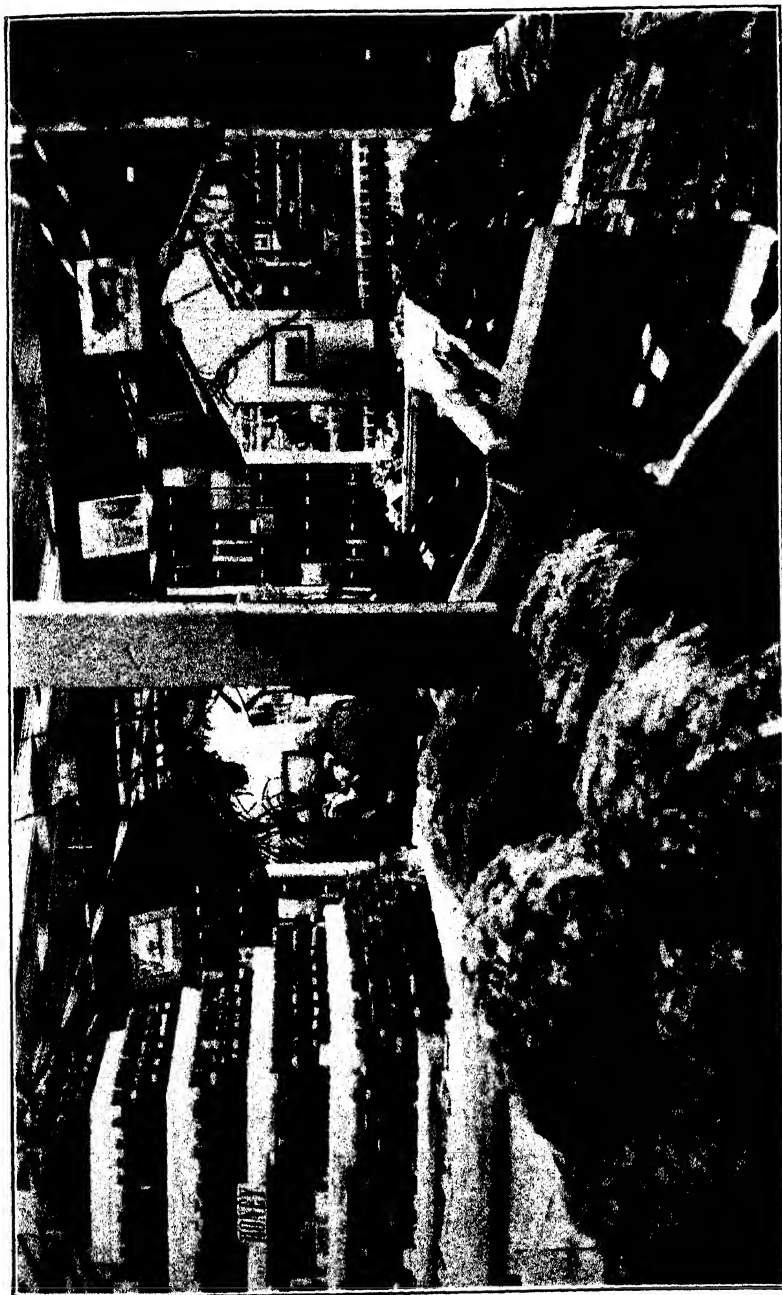


PLATE 95.—NORTHERN DARLING DOWNS DISTRICT EXHIBIT, 2ND IN "B." DISTRICT EXHIBIT COMPETITION,  
ROYAL NATIONAL ASSOCIATION SHOW, 1928.

## CHEESE COMPETITION.

The Southbrook Co-operative Dairy Association Limited won the prizes in both the white and coloured export classes, and the Downs Co-operative Dairy Association's Westbrook factory that for the loaf cheese under six weeks old. The cheese-maker of the Biddeston Association secured the special prize awarded which follows in conjunction with that company having secured the highest aggregate in the competitions. Details:—

Export Cheese, coloured, suitable for English market, two cheeses each 70 lb. to 80 lb. (One judged on arrival and other forwarded to London, where it will be judged.)

	Flavour.	Texture	Colour.	Finish.	Total.
Possible points .. .. .	50	25	15	10	100
Southbrook Co-operative Dairy Co., Ltd. ..	44	25	15	10	94
Biddeston Co-operative Dairy Association ..	43½	25	15	10	93½
Downs Co-operative Dairy Association, Lilyvale ..	43½	25	14½	10	93
Irongate Co-operative Dairy Association ..	43½	25	14½	10	93
Pittsworth Dairy Company "P" factory ..	43½	24½	14½	10	92½
Pittsworth Dairy Co., "Y" factory ..	44	25	13½	10	92½
Downs Co-operative Dairy Association, Westbrook	43	24½	14½	10	92½
Yargullen Co-operative Dairy Association ..	42	25	15	10	92
Downs Co-operative Dairy Association, Koondai	42½	25	14½	10	92
Oakey District Co-operative Association, Crosshill	42½	24½	14½	10	91½
Downs Co-operative Dairy Association, Hodgson's					
Vale .. .. .	42	25	14½	10	91½
Downs Co-operative Dairy Association, Wyreema	42	25	14½	10	91½
Oakey District Co-operative Dairy Association,					
Kelvinhaugh .. .. .	42	24½	14½	10	91½
Mount Tyson Farmers' Co-operative Dairy Asso-					
ciation .. .. .	42	25	14	10	91
Woodleigh Cheese Factory .. .. .	42	24½	14½	9½	90½
Waverley Cheese Factory .. .. .	41	24½	14½	10	90½
MacLagan Valley Co-operative Dairy Association	41½	25	13½	10	90
Warwick Co-operative Dairy Association, Bony					
Mountain .. .. .	41	25	14	10	90
Downs Co-operative Dairy Association, Boodua ..	41½	24½	13	10	89
Warwick Co-operative Dairy Association, Grey-					
mare .. .. .	39	24½	14	10	87½

Export Cheese, white, suitable for English market, two cheeses, each 70 lb. to 80 lb.

Southbrook Co-operative Dairy Association ..	44½	24½	14½	10	94
Irongate Co-operative Dairy Association ..	44½	24½	14½	9½	93½
Biddeston Co-operative Dairy Association ..	44	24½	14½	10	93½
Mount Tyson Farmers' Co-operative Dairy Asso-					
ciation .. .. .	43	25	15	10	93
Pittsworth Dairy Co., "P" factory .. .. .	44	24½	14½	10	93
Waverleigh Cheese Factory .. .. .	43	25	15	10	93
Downs Co-operative Dairy Association, Wyreema	43	25	15	9½	92½
Yargullen Co-operative Dairy Association ..	43	24½	15	10	92½
MacLagan Valley Co-operative Dairy Association	43	24½	15	10	92½
Downs Co-operative Dairy Association, Koondai	43	25	14½	10	92½
Downs Co-operative Dairy Association, Lilyvale ..	43	24½	14½	10	92½
Oakey District Co-operative Dairy Association,					
Kelvinhaugh .. .. .	42½	24½	14½	10	91½
Warwick Co-operative Dairy Association, Grey-					
mare .. .. .	41½	25	15	10	91½
Woodleigh Cheese Factory .. .. .	42	24½	14½	10	91½
Downs Co-operative Dairy Association, Boodua ..	42½	24½	14½	10	91
Downs Co-operative Dairy Association, Hodgson's					
Vale .. .. .	41½	24½	14½	10	90½
Oakey District Co-operative Dairy Association,					
Crosshill .. .. .	41½	24½	14½	10	90½

CHEESE COMPETITION—*continued.*

Loaf Cheese, under six weeks old; two, each not exceeding 12 lb.

	Flavour.	Texture.	Colour.	Finish.	Total.
Possible points .. .. .	50	25	15	10	100
Downs Co-operative Dairy Association, Westbrook	44½	25	14½	10	94
Biddeston Co-operative Dairy Association ..	44	25	14½	10	93½
Downs Co-operative Dairy Association, Koondai	44	25	14½	9½	93½
Downs Co-operative Dairy Association, Hodgson's Vale .. .. .	43½	25	14½	10	93
Downs Co-operative Dairy Association, Lilyvale ..	43	25	15	10	93
Downs Co-operative Dairy Association, Wyreema	43	24½	14½	10	92½
Pittsworth Dairy Co., "P" factory .. ..	43	24½	14½	10	92
Pittsworth Dairy Co., "Y" factory .. ..	43	24½	14½	10	92
Yargullen Co-operative Dairy Association ..	42½	24½	14½	10	91½
Irongate Co-operative Dairy Association ..	42½	25	14½	9½	91½
Downs Co-operative Dairy Association, Boodua ..	42½	24½	14½	10	91½
Oakey Co-operative Dairy Association, Kelvinhaugh .. .. .	42	25	14½	10	91½
Woodleigh Cheese Factory .. .. .	42½	24½	14½	9½	91½
MacLagan Valley Co-operative Dairy Association	42	24½	14½	10	91
Southbrook Co-operative Dairy Association ..	41	25	15	10	91
Waverleigh Cheese Factory .. .. .	41½	25	14½	9½	90½
Warwick Co-operative Dairy Association, Bony Mountain .. .. .	41	25	14	10	90
Warwick Co-operative Dairy Association, Grey-mare .. .. .	39	25	14	9	87

Medium Cheese, over two months old; two, each not exceeding 40 lb.

Southbrook Co-operative Dairy Association ..	45½	25	15	9½	95
Downs Co-operative Dairy Association, Lilyvale ..	44½	25	15	10	94½
Downs Co-operative Dairy Association, Boodua ..	44	25	15	10	94
Biddeston Co-operative Dairy Association ..	44	24½	14	10	93
Oakey District Co-operative Dairy Association, Crosshill .. .. .	43	25	14½	10	92½
Downs Co-operative Dairy Association, Westbrook	43	25	15	9½	92½
Woodleigh Cheese Factory .. .. .	42	25	15	9½	91½
Pittsworth Dairy Co., "P" factory .. .. .	42½	24½	14½	10	91½
Downs Co-operative Dairy Association, Koondai	41½	25	15	9½	91
Sunnyvale Co-operative Cheese Association ..	42	25	14½	9½	91
Yargullen Co-operative Dairy Association ..	42½	24½	14½	9½	91
Downs Co-operative Dairy Association, Hodgson's Vale .. .. .	42	25	14½	9	90½
MacLagan Valley Co-operative Dairy Association	41½	25	14½	9½	90½
Oakey District Co-operative Dairy Association, Kelvinhaugh .. .. .	41	25	14½	9½	90
Downs Co-operative Dairy Association, Wyreema	41	24½	14½	9½	89½
Warwick Co-operative Dairy Association, Grey-mare .. .. .	39	25	14½	9½	88

Medium Cheese, under six weeks old; two, each not exceeding 40 lb.

Biddeston Co-operative Dairy Association ..	44½	25	15	10	94½
Downs Co-operative Dairy Association, Westbrook	44	25	14½	10	93½
Pittsworth Dairy Co., "Y" factory .. .. .	43½	25	15	9½	93½
Downs Co-operative Dairy Association, Koondai	43	25	15	10	93
Pittsworth Dairy Co., "P" factory .. .. .	44½	24½	14½	9½	93
Southbrook Co-operative Dairy Association ..	42½	25	15	9½	92½
Downs Co-operative Dairy Association, Wyreema	43	25	14½	9½	92
Yargullen Co-operative Dairy Association ..	42	25	14½	9½	91½
Downs Co-operative Dairy Association, Boodua ..	41½	25	14½	10	91
Downs Co-operative Dairy Association, Lilyvale ..	41½	25	14½	10	91
Irongate Co-operative Dairy Association ..	42½	24½	14½	9½	91

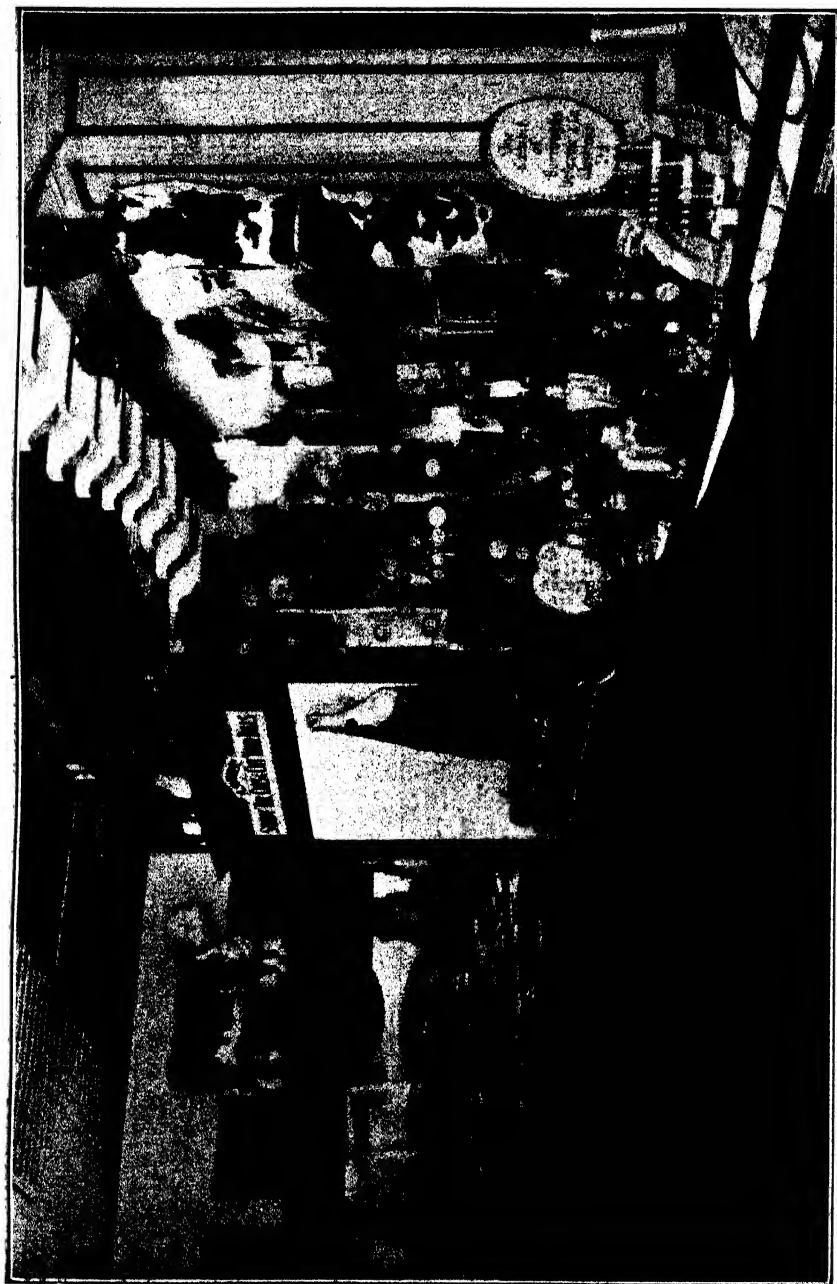


PLATE 96.—THE REMARKABLE RANGE OF SUBSIDIARY INDUSTRIES, WHICH DEPEND UPON THE PASTORAL INDUSTRY FOR RAW MATERIAL, WAS REPRESENTED MOST STRIKINGLY IN THE MEAT HALL AT THIS YEAR'S BRISBANE SHOW.

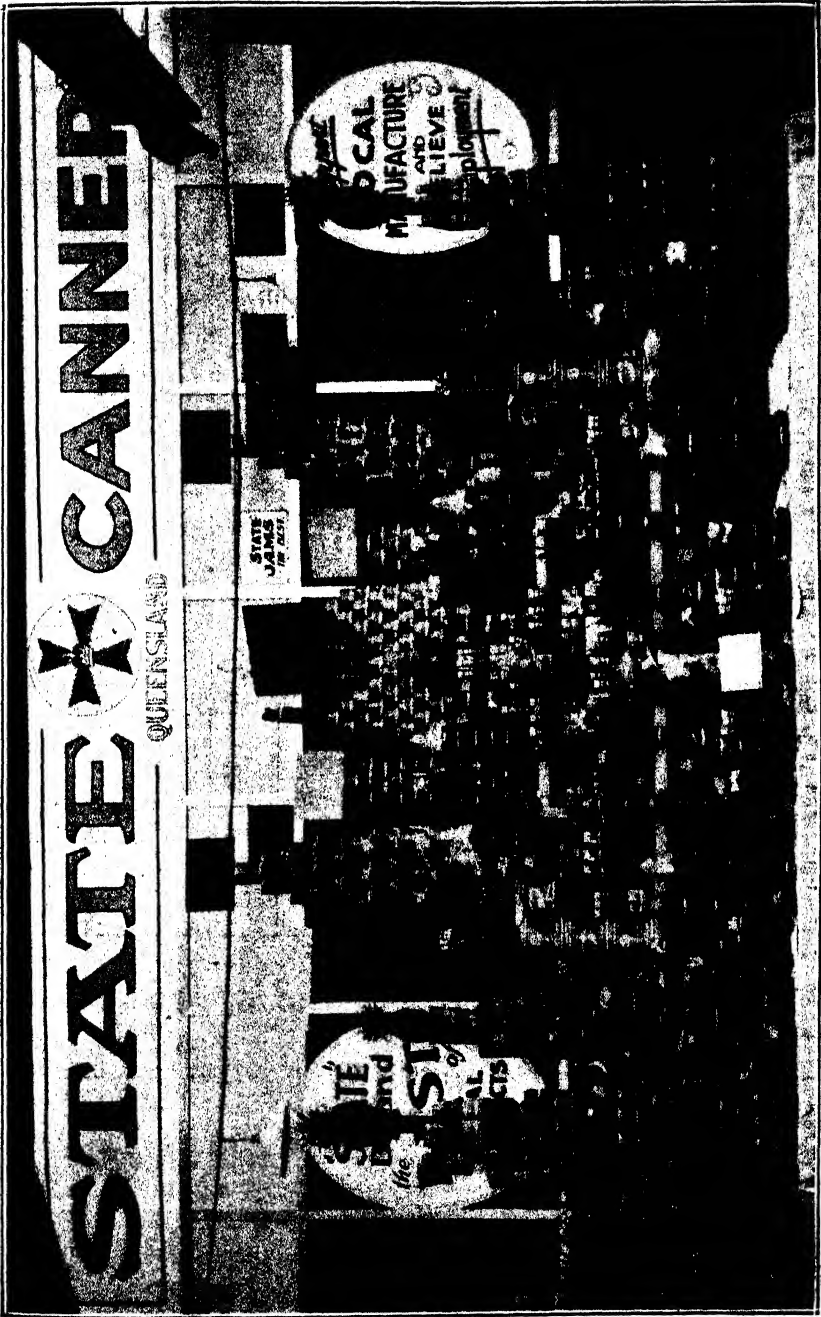


PLATE 97.—A FINE DISPLAY FROM THE STATE CANNERY.

CHEESE COMPETITION—*continued.*Medium Cheese under six weeks old; two, each not exceeding 40 lb.—*continued.*

	Flavour.	Texture.	Colour.	Finish.	Total.
Possible points .. .. .	50	25	15	10	100
Oakey District Co-operative Dairy Association, Kelvinhaugh .. .. .	42½	24½	14½	9½	91
Waverley Cheese Factory .. .. .	41½	25	15	9½	91
Warwick Co-operative Dairy Association, Bony Mountain .. .. .	41	25	14½	9½	90½
MacLagan Valley Co-operative Dairy Association .. .. .	41	25	14½	9½	90
Woodleigh Cheese Factory .. .. .	41½	24½	14½	9½	90
Downs Co-operative Dairy Association, Hodgson's Vale .. .. .	40	25	15	10	90
Warwick Co-operative Dairy Association, Grey-mare .. .. .	40½	25	14½	9½	89½

Loaf Cheese, over two months old; two, each not exceeding 12 lb.

Downs Co-operative Dairy Association, Westbrook	44	25	14½	10	93½
Biddeston Co-operative Dairy Association ..	43	25	15	10	93
Downs Co-operative Dairy Association, Boodua ..	43	25	14½	10	92½
Downs Co-operative Dairy Association, Lilyvale ..	41½	25	14½	10	91½
MacLagan Valley Co-operative Dairy Association	41½	25	14	10	90½
Yargullen Co-operative Dairy Association ..	41½	24½	14½	9½	90½
Southbrook Co-operative Dairy Association ..	41	25	14½	9½	90½
Oakey District Co-operative Dairy Association ..	41	25	14½	9½	90
Downs Co-operative Dairy Association, Wyreema	40½	25	14½	10	90
Downs Co-operative Dairy Association, Hodgson's Vale .. .. .	41	25	14½	9½	90
Woodleigh Cheese Factory .. .. .	41	25	14½	9½	90
Sunnyvale Co-operative Cheese Association ..	41	24½	14½	9½	89½
Pittsworth Dairy Co., "P" factory .. .. .	40	25	14½	9½	89½
Oakey District Co-operative Dairy Association, Crosshill .. .. .	39	25	15	9½	88½
Downs Co-operative Dairy Association, Koondai	39	25	14½	9½	88½
Warwick Co-operative Dairy Association, Grey-mare .. .. .	39	25	14	9½	87½

Special Prize for factory securing the greatest aggregate of points in all classes except trophy.

	Total points.
Biddeston C.D.A. .. .. .	561
Downs C.D.A., Westbrook .. .. .	558½
Southbrook C.D.A. .. .. .	556½
Downs C.D.A., Lilyvale .. .. .	550½
Downs C.D.A., Koondai .. .. .	550
Downs C.D.A., Boodua .. .. .	549
Yargullen C.D.A. .. .. .	548½
Downs C.D.A., Wyreema .. .. .	548
Downs C.D.A., Hodgson's Vale .. .. .	545½
Pittsworth D.C. "P" Factory .. .. .	545½
Woodleigh Cheese Factory .. .. .	545
MacLagan Valley C.D.A. .. .. .	544½

*Trophy of Cheese.*—Downs Co-operative Dairy Association's Lilyvale Factory, 1; Pittsworth Dairy Company's "P" Factory, 2.

### JUDGE'S COMMENTS.

"Taking the cheese exhibit as a whole, the quality was somewhat disappointing. Many of the entries scarcely reached the minimum points for choice grade cheese. The principal defects were in flavour, texture, and colour."

These were the views of the judge (Mr. M. Wallace, senior grader, Commonwealth Grading Branch, Brisbane), as expressed in an interview.

"In many cheeses the flavour was faulty," said the judge, "the body inclining to be too firm and the texture rough. The most notable defect, however, was in the colour, a distinct mottle or streak being apparent in a great many of the entries in both the coloured and uncoloured classes. This was often associated with weakness in flavour and sometimes a pastiness in the body. This weakness was expected in view of the fact that at the time a large proportion of the cheese was manufactured, streakiness or mottle was causing cheese-makers a considerable amount of trouble. The points awarded for even the best cheese were not so high as the judge felt inclined to award in many previous years. One feature on which the manufacturers can be congratulated is the excellence of finish in nearly all of the exhibits, a large proportion securing full points for this.

### Value of Trophies.

"There were two entries for the class for the trophies, and seldom has a better display in this respect been offered in the cheese pavilion. The arrangements in each of the trophies were entirely dissimilar, making it very difficult to assess the respective values in display and effect. The quality of the cheese in both trophies was good, the Unity cheese being only slightly better than the cheese on the Pittsworth stand. The display in both was excellent, and the effectiveness of the lighter arrangement in the winning trophies gave it an advantage over the more solid appearance of the cheese staged by the Pittsworth company. These trophies are more than spectacular. To the average person engaged in the manufacture of cheese they convey many lessons in the finish and general get-up which would be of advantage if applied to some extent at least to the ordinary output of a factory. In fact, much of the credit for the general attractive appearance of the cheese shown at the show and also that of ordinary manufacture in Queensland is due to the lessons to be learned from these trophies.

"Speaking generally, the quality of the cheese exhibits may be said to reflect the average quality produced in Queensland during autumn and early winter. The figures for the two Orient classes will not be available until the cheese to be despatched to London are judged there, when the entries securing the highest aggregate points at Brisbane and London will be declared the winners."

### FRUIT PACKING.

JOHN MACDONALD SHIELD.

The fruit-packing competition for present and past pupils attending fruit-packing classes under the Department of Agriculture resulted:—

	Points.
Palmwoods School, No 1 team .. .. .	822
Mapleton School .. .. .	797
Montville .. .. .	790
Flaxton .. .. .	785
Palmwoods, No. 2 team .. .. .	781
Woombye .. .. .	771
Buderim Mountain .. .. .	764½
Nambour .. .. .	742

*Best Individual Fruit Packs.*—Miss Alice Hall (Palmwoods), Master Tom Briggs (Palmwoods), and Miss Freda Pack (Mapleton), equal, 84 points, 1; Miss Verle Hobson (Palmwoods), and Miss Isobel Murray (Palmwoods), equal, 83½ points, 2.



PLATE 98.—A WINNING EXHIBIT IN FRUIT PACKING FROM PALMWOODS' SCHOOL No. 1 TEAM.

The John Macdonald Shield Competition in Fruit Packing is a popular Annual Contest. The competitors are present and past pupils of State Schools attending fruit packing classes under the Department of Agriculture.

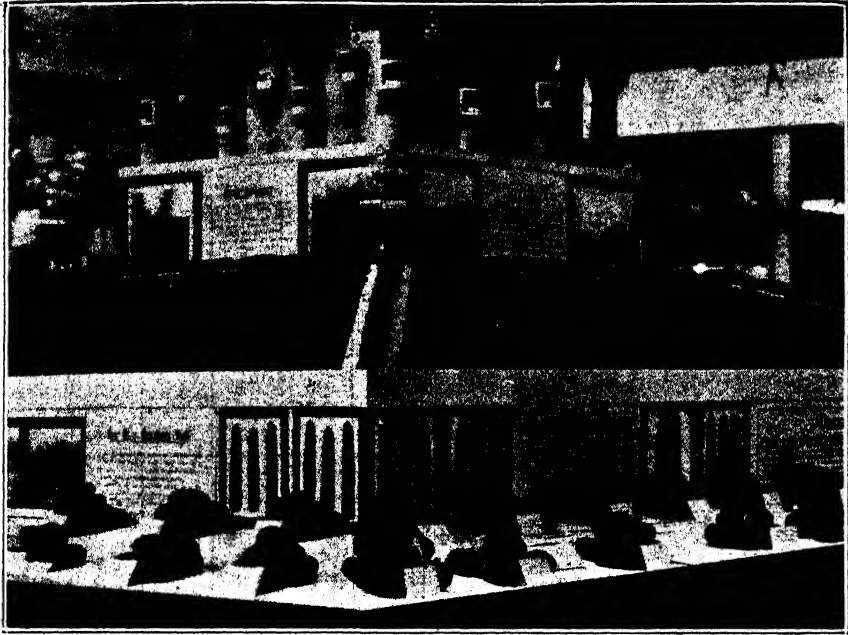


PLATE 99.—ANOTHER CLOSE-UP OF THE CENTRAL TROPHY IN THE COURT OF  
THE DEPARTMENT OF AGRICULTURE AND STOCK.  
Illustrating the practical work done by Departmental Specialists in Crop Improvement.



PLATE 100.

This Display by the Queensland Agricultural High School and College illustrated the advance made in this State in rural education ; and also the work and efficient training of student farmers.

**ONE-FARM COMPETITION.**

Winners of the 1927 one-farm competition, Messrs. Franke and Sons, repeated their success at this year's Exhibition. Mr. J. Beck, who travelled 400 miles from his farm at Stanwell to compete, filled second place. This class attracted entries from Messrs. W. D. Ponton (Tuggerah, N.S.W.), E. J. Rossow (Nanango), J. Beck (Stanwell), H. Franke and Sons (Cawdor), and J. T. Whiteway (Buderim). Details:—

Produce.	Possible Points.	W. D. Ponton.	E. J. Rossow.	J. Beck.	H. Franke & Sons.	J. T. Whiteway.
Butter .. .. .	25	20	18	19	18	18½
Cheese .. .. .	20	10	10	11	20	11
Eggs .. .. .	5	3	3	4	3	2
Totals .. .. .	50	33	31	34	41	31½
<b>FOODS—</b>						
Hams, bacon .. .. .	20	15	13	16	18	13
Corned and other meats .. .. .	10	8	8	8	8	7
Honey and by-products .. .. .	15	12	8	8	9	6
Beeswax .. .. .	5	4	2	3	3	4
Bread, scones .. .. .	5	3	3	5	5	4
Confectionery and sweets .. .. .	5	4	5	4	3	4
Home cookery .. .. .	7	6	6	6	7	5
Lard, tallow, &c. .. .. .	5	4	3	4	4	4
Totals .. .. .	72	56	48	54	57	47
<b>FRUITS, VEGETABLES, AND ROOTS—</b>						
Fresh fruits .. .. .	25	22	10	18	15	23
Preserved fruits .. .. .	15	14	11	13	12	13
Crystallised and dried fruits .. .. .	10	9	7	8	9	8
Preserved vegetables .. .. .	15	11	9	9	13	13
Fresh vegetables .. .. .	15	10	11	9	15	12
Table pumpkins .. .. .	10	8	9	8	8	9
Potatoes and roots .. .. .	20	15	16	16	15	9
Cocoanuts and nuts .. .. .	7	3	3	2	4	5
Vegetable seeds .. .. .	5	5	4	2	3	2
Roots, all kinds .. .. .	15	11	10	11	9	14
Home-made meals .. .. .	3	1	2	2	2	3
Totals .. .. .	140	109	92	98	105	111
<b>GRAIN, ETC.—</b>						
Wheat .. .. .	25	16	16	18	23	6
Maize .. .. .	25	22	23	16	23	14
Barley, oats, &c. .. .. .	20	17	7	8	10	5
Home-made meals .. .. .	10	8	9	7	7	7
Totals .. .. .	80	63	55	49	63	32
<b>TROPICAL PRODUCTS—</b>						
Sugar-cane .. .. .	30	3	10	18	8	19
Cotton in seed .. .. .	20	12	20	18	18	16
Coffee .. .. .	6	6	6	6	0	6
Totals .. .. .	56	21	36	42	26	41

ONE-FARM COMPETITION—*continued.*

Produce.	Possible Points.	W. D. Ponton.	E. J. Rossow.	J. Beck.	H. Franke & Sons.	J. T. Whiteway.
<b>TOBACCO—</b>						
Tobacco leaf .. .. .	10	10	8	8	10	10
<b>HAY, CHAFF, ETC.—</b>						
Hay .. .. .	20	15	16	19	19	7
Hay in sheaf .. .. .	5	5	5	5	5	2
Grasses and seeds .. .. .	10	7	9	10	8	6
Chaff .. .. .	20	9	19	16	19	9
Ensilage .. .. .	15	9	14	12	12	11
Cattle fodder .. .. .	15	9	10	14	14	4
Sorghum and millet .. .. .	10	6	10	7	7	5
Broom millet .. .. .	10	6	9	7	8	6
Cowpea seed .. .. .	7	5	7	5	5	4
Flax and hemp .. .. .	10	7	5	4	5	9
Totals .. .. .	122	78	104	99	102	63
<b>WOOL—</b>						
Greasy .. .. .	20	20	17	18	17	13
Mohair .. .. .	5	4	5	5	5	4
Totals .. .. .	25	24	22	23	22	17
<b>DRINKS, ETC.—</b>						
Temperance drinks .. .. .	15	9	8½	10	8½	8½
<b>WOMEN'S AND CHILDREN'S WORK—</b>						
Needlework and knitting .. .. .	10	3	1	6	7	9
Fine arts .. .. .	5	2	3	2	3	2
Fancy work .. .. .	15	5	3	9	8	10½
School work .. .. .	5	2	4	4	3	4½
School needlework .. .. .	5	2	..	3	2	4
Totals .. .. .	40	14	11	24	23	30
<b>MISCELLANEOUS—</b>						
Articles of commercial value .. .. .	10	8	5	6	10	9
<b>PLANTS AND FLOWERS IN POTS .. .. .</b>	6	3	4	1	6	4
<b>TIME AND LABOUR-<b>SAVING ARTICLES</b> .. .. .</b>	10	8	6	..	7	10
<b>EFFECTIVE ARRANGEMENT—</b>						
Comprehensiveness of view .. .. .	10	8	8	8	9	8
Arrangement of stands .. .. .	10	8	7	9	10	8
Effective ticketing .. .. .	5	4	4	5	4	4
General finish .. .. .	15	13	11	12	15	9
Totals .. .. .	40	33	30	34	38	29
Grand Totals .. .. .	676	469	460½	482	518½	443

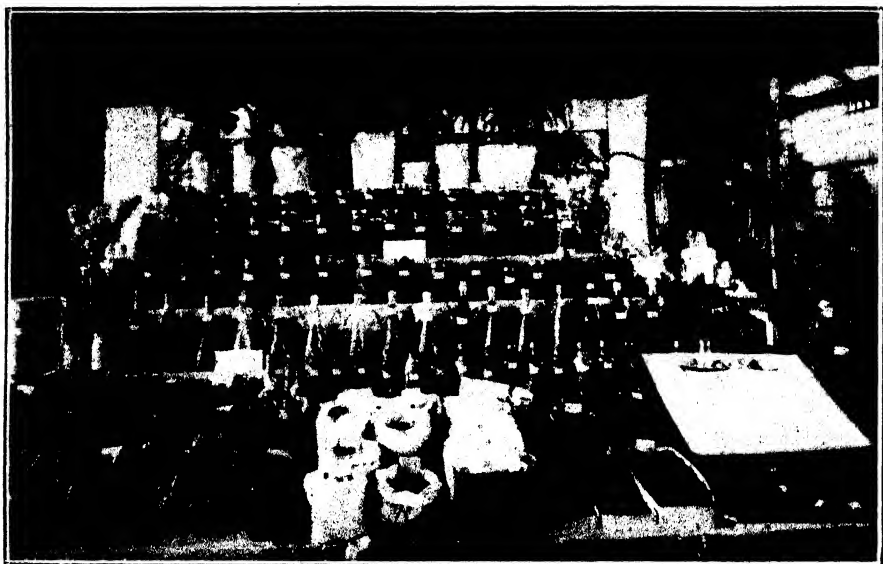


PLATE 101.—1ST PRIZE, ONE FARM EXHIBIT, ROYAL NATIONAL ASSOCIATION'S SHOW, 1928—H. FRANKE, CAWDOR.

### SHIELD COMPETITIONS.

In addition to the prize offered for the district fruit display, three shields were provided—one each for bananas, citrus fruit, and pineapples. The details of the results of the banana and citrus shield contests are given below. Cooran won the banana shield, and Palmwoods the citrus shield:—

#### BANANA SHIELD.

			Cavendish.	Lady Fingers.	Sugar.	Other Varieties.	Points.
Possible points	..	..	80	10	5	5	100
Cooran	..	..	73	8	3	5	89
Palmwoods	..	..	67	7	2	3	79
Buderim Mountain	..	..	63	9	3	3	78
Redlands	..	..	57	9	..	3	69
Montville	..	..	55	7	2	2	66
Woombye	..	..	48	6	2	2	58

#### CITRUS SHIELD.

			Oranges.	Mandarins.	Lemons.	Other Varieties.	Points.
Possible points	..	..	40	40	10	10	100
Palmwoods	..	..	37	37	7½	6	87½
Montville	..	..	36	36	7	4	83
Gayndah	..	..	33	35	9½	5½	83
Buderim	..	..	32	33½	6½	5½	77½
Redlands	..	..	32	32	6½	5	75½
Woombye	..	..	31	33½	6½	3	74
Cooran	..	..	23	21	4½	4½	53

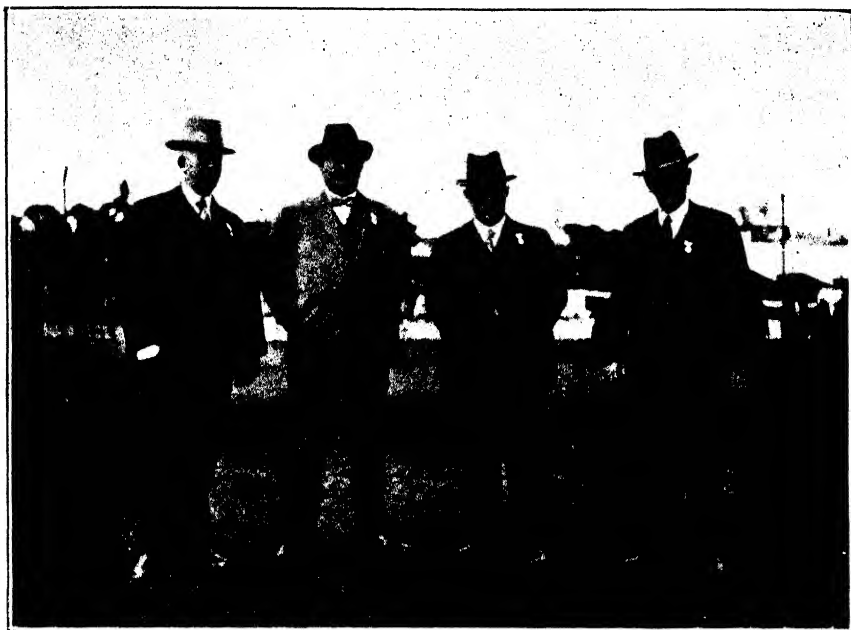


PLATE 102.—HORSE JUDGES, BRISBANE ROYAL NATIONAL SHOW, 1928.  
In the group are Messrs. J. I. Fanning (Townsville), J. Macdonald (Sydney),  
W. Milling (Sydney), Frank Howell (Sydney).



PLATE 103.—RING OFFICIALS AT THE ROYAL SHOW, BRISBANE, 1928.  
Included in the group are Messrs. P. J. Symes, H. S. Cribb, C. R. Pickworth, J. H.  
Fairfax, and Major-General Spencer Browne.

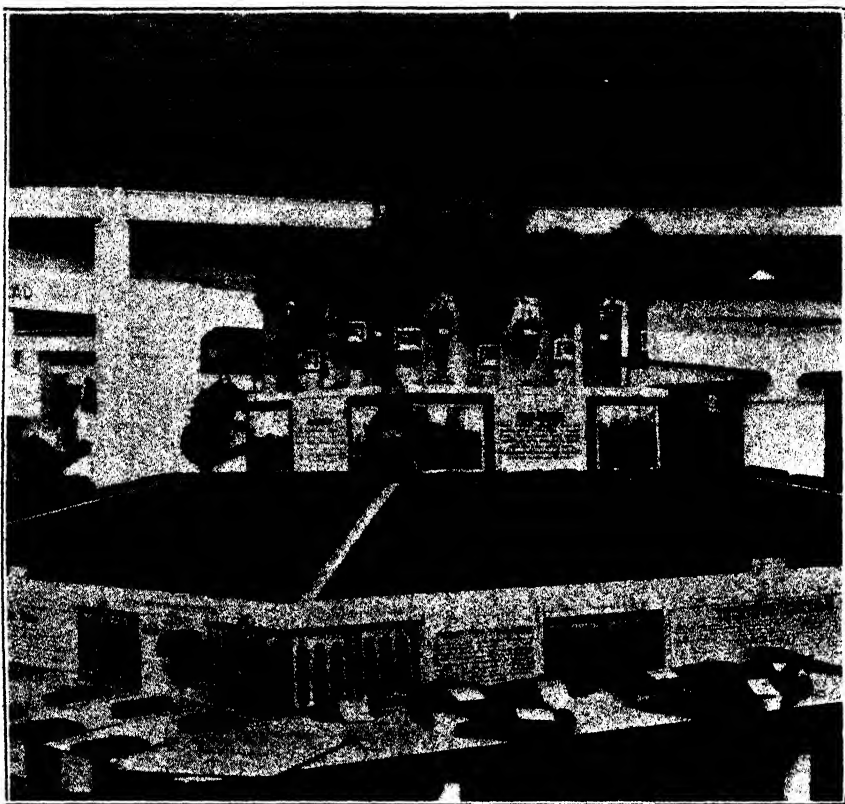


PLATE 104.—A CLOSE-UP OF THE CENTRAL TROPHY, COURT OF THE DEPARTMENT OF AGRICULTURE AND STOCK, 1928, BRISBANE SHOW.

The work of the Departmental Officers in Grain Improvement was demonstrated most strikingly in this Exhibit.

### EFFECT OF TOP-DRESSING ON WOOL.

Though there can be no question as to the added feeding value to top-dressed pastures, writes the Sheep and Wool Expert of the New South Wales Department of Agriculture, there is a good deal of uncertainty as to the effect on the wool fibre of a sheep that is run continually on pastures which have been treated to an application of superphosphate. It has been decided, therefore, to inaugurate trials in different districts as a means of collecting data on this point.

The idea is to select an even lot of sheep, wethers for preference, as they are less liable to change from year to year, and divide them into lots—one lot to be run on top-dressed pasture, and the other lot to be left on natural pasture. Certain individual sheep will be marked in each lot, and at shearing time samples of their wool will be specially taken and kept for twelve months, when wool from the same spot will be taken for comparative purposes. Results up to the first shearing in the spring will be kept for the trials about to be commenced, but it is expected that more definite data will be obtainable over the following twelve months when the manure will have had more chance of becoming effective.

**THE CULT OF THE COLT.\***

By "U9L."

## III.

**TEACHING TO LEAD.**

Let me have a word or two to say about the bearing-reins before going further. There's not the least need to have these tight. In fact, if they are loose enough to allow the colt free play with his head, and just tight enough to prevent him throwing it straight up in the air, that is all that is needed of them. A heavy-headed horse is an invention of the devil, and there are few joys to equal the pleasure of riding a horse whose mouth is responsive to your lightest touch and wish. Tight bearing-reins are merely the mechanical equivalent of a heavy-handed rider. Some men will say the colt's mouth will have to be made tender. It hasn't to be made so at all—it'll get that way itself during the breaking process in spite of all you can do to prevent it! Why, then, add to the thing's troubles?

With some breakers, they prefer to teach the youngster to lead before putting the tackling on it. It's immaterial. I like to use the tackling first. The mere fact of putting that on, and the pulling about to which the colt is subjected during that tackling process, is all part of the tuition to lead. I don't try and cause two deaths with one missile; but I like to help to achieve two objects with one purpose. That's why I tackle first and teach to lead later. After the colt's had the tackling for a few hours, or for a day, and which has skimmed some of the fizz off his spirits, we'll teach him to lead. We're not finished with the tackling, and this is just a break in the process to interrupt the monotony of the thing.

**A Whip out of Place in a Horse Yard.**

Some people use a whip to teach a youngster to lead. I don't. It's an easy way, and it impels obedience. Also, if the colt has any smouldering ash of malice in his composition that whip will fan it to a flame quickly. Anyway, apart from everything else, a whip's out of place in a horse-yard, with any class of horse or with any number. Other people teach a horse to lead by lugging it about, swinging it from side to side, coaxing and petting it till it leads. I've done that, and great was the volume of sweat which rolled from me. That's a tedious task. The best thing of the lot, in my opinion, is a length of clothes line. Tie a loop in it big enough to go over the horse's rump, one side of the loop resting on his loins and the other side of it dangling about his buttocks. Take the line from that loop through the roller, through the breastplate, and run it through the chin-strap of the halter. With the shank of the halter in your hand, and in the other the line from the loop, you're set. Let's begin.

**Soothe and Pet the Colt.**

The first thing is to soothe the colt. Pet him and make him understand that line dangling about him isn't harmful. Get him at his ease and use everything you have to make him feel comfortable. Standing out in front of him you click to him with your tongue, pull lightly on the shank, and snap smartly with the loop-line. The latter is just a shade later than the former. The colt ignores the halter pull beyond stretching forward with his head; but when that line tightens on his buttocks he bounds forward. Now's your chance, and take it quickly. Point out to the colt that the bound forward was just the thing expected of him, that the line won't hurt him, and soothe the small fright which is his. That's easy, and almost before you or the colt knows it, with the judicious use of the loop, he's leading freely. By the way, and though recognising we're not all gifted, or cursed, alike, I've found that if I place the palm of my hand on a colt's forehead, leave it there a second or two and then draw it away in a lingering motion that he'll usually follow. Try it, will you, and remember that our sole object in all this exercise is to get the youngster to step over the bounds of his instinct to the extent of following us—we who are his hereditary enemy! What's your pet abomination in a leading horse? I'll tell you mine—it's an animal you have to skull-drag as you lead it. Instead of coming freely there's a dead weight dragging on the end of the reins all the time, and if you quicken your stride a fraction the horse sits back. That's awful. Most of that is brought about in the breaking in. If a man drags his colt all the time, then that colt is a dragger for life unless strenuously corrected. Please, if you have any good wishes towards me at all, teach the

\* From the "Pastoral Review" for May. Previous notes on this subject, by the same interesting and well-informed writer, were reprinted in the March and August Journals from the February and April numbers of the "Pastoral Review."

youngster to step freely when you're leading it. It's easy. Once the thing is leading, don't drag him. Make him come up to his work and step freely behind you, and, greatest pleasure of all, make him walk beside you as a white man should. There's a bond of sympathy between you and a colt which isn't a skulker and who's game to face the world beside you. It's worth doing for the pleasure it brings. If you can't do it any other way, catch the rein near the bit in your left hand, reach over his neck and shoulder with your right hand, and as you step forward, leading with the left, smack him down the shoulder with a bit of a twig in your right. It's easy, and it's a lesson quickly learned. I reckon one of the prettiest sights I ever saw was a colt of my breaking in the show ring. When his rider dismounted and walked about, that colt, with his neck arched and his ears pricked, taking an intelligent interest in all he saw, stepped beside his rider. When the man stopped the horse stood still beside him, and as the man lifted his foot to step forward the horse moved with him. Honest, though he came out of the ring without a ribbon, I felt proud of that little horse.

### Use Common Sense and Judgment.

When we've taught the colt to lead a bit we'll put him back in the yard and attach the tackling to him once more. After this has been on him a time or two it's not a bad line to substitute an old saddle in place of the regulation roller. And don't be mean about the saddle-cloth. Hang one on each side of the saddle, hang a bag across his loins or suspended from the crupper staple on each side, and the more fluttering gear you have about the thing the better it is for him. It doesn't in itself achieve any useful purpose, but it all helps to quieten him and accustom him to the foolish ways of man. But there's a medium in that also. Some horses are sulky, vicious, spiteful, and intolerant. It's not the nervous or the frightened horse to which I refer—don't run away with that idea—and the animal which I have under review is what one refers to as a hyphenated pig or a sanguinary swine. Here's the sort of thing to which I refer. One mare I was breaking in, as she ran round the yard, used to kick every time she passed at the chain on the gate. Now, it was an in-offensive chain and didn't deserve that treatment. I shifted it out of sight and pegged the gate from the outside. Did that discourage her ladyship? Only for one round was she beat. Then she picked out a certain spot on the rails, and every time she passed that spot, for no apparent reason at all, she let it have both heels. What are you going to do with a brute like that? When I tackled her she backed against the rails of the yard and, for five minutes at a spell, she'd stand in the one position with her front feet and play with both hind heels against the yard. Now it's at once apparent to you, with brutes of that sort, it's only pandering to their evil spirit and feeding their base desires when you give them any excuse to kick. Some may get a sickener of it in short order, and others will break their puny hearts and grow a canker of malevolence only against your efforts to make them tractable. You've got to use judgment in this. But in your favour rests the fact that a horse which is going to be worth while won't play the fool in vicious ignorance to any great extent, and though he mightn't submit tamely, if he's ever going to be any good at all, he's got enough sense to know what's good for him. Use judgment, sir, when you're packing your colt with flapping bags, and in all things take into consideration the temperament which is his, plus or minus, as the case may be, the mental peculiarities which are yours. I have finished, and I hope I have made myself understood.

### Getting the Colt's Confidence.

Each time we catch the colt now, and we're doing it regularly all day long, he gets easier to catch. Even so, instead of us catching him, why not make him come to us when we want him? It's easy, not harmful, takes but little time, creates a good effect, helps to give the colt confidence, and, I think, has everything in its favour. Let's do it. When we put the colt in the round yard, or whatever other yard it is in which we tackle him, what's his first desire? I'll tell you—it's to get out again. Where does it look to get out? By the same way as that which it entered, of course—by the gate. If you leave that gate open the colt won't be two flicks of time before he's out again, and even after you shut it he'll revert to it. Let's leave it open, standing in that open gateway ourselves. As soon as the colt sees the road to freedom he comes to it, but when he sees us there he sheers off. Very well, we'll leave it open and take our stand in it. The colt wants to get through, but he's not game. He'll go and stand over on the far side of the yard, continually turning his head to the open gate, and wishing to goodness that we'd move out of the way. Half a dozen times he comes to it, and as many times he turns from us, and finally stands over on the other side of the yard. When we click to him, or snap our fingers at him, or call him by word of command, he turns his head and

wonders. He's got an inkling of what's desired, and he wants to come to us as that's his road to freedom; but he's afraid. If we can't bring him any other way we'll pick up a bit of a pebble or a lump of caked mud and throw it at him to hit him on the ribs. That's a special detestation of horses, by the way. That moves him to action and a great desire to leave his prison. The way out is open, but we're blocking it. After a bit, by the moral suasion which we exert, or by the fact the lumps of mud have made the yard uncomfortable, the colt tries to get through the open gateway in spite of us blocking the way. This is where we show ourselves in our might and strength. We step out in front of him and block him, and then by all the blandishments we possess, and feeding him all the verbal lolly and soft stuff we have in stock, do we convince that colt that he'd done the right thing in trying to get out. After a couple of times he comes to us almost of his own accord as soon as we call him, and using his own desires to cloak our purpose do we teach him to come to us when called. Do you follow my argument? Do you see the course of my reasoning? That's merely the foundation of the trick, and I leave it to your individual selves to build what fancy top-structures your desires might prompt. On a good foundation you may build high, and I know it's a solid basement which I've offered you.

## CARE OF THE FARM TRACTOR.

By G. W. WATSON, M.I.Mech.E., M.I.A.E.\*

**A**T a Rothamsted (England) conference recently the subject of "Power for Cultivation and Haulage on the Farm" was discussed. An account of the proceedings has been published, in which the following note appeared:—

An agricultural machine or implement usually suffers from the simple fact that it is an inanimate object—i.e., it is without life or soul. Whilst most owners will give some measure of personal attention to even the meanest and least profitable animal on a farm, there are many who, having bought a machine, turn it over to a heavy-handed individual who has no knowledge of its construction, no interest in its success, and little or no inducement to acquire that knowledge or simulate an interest. Tractors may be divided, roughly, into two broad classes—firstly, the petrol or paraffin class; and, secondly, the steam class. I propose to confine my remarks to the former. If an engine starts up at the first swing and runs with a healthy purr, indicating that all is well, a driver feels that he has made a good start for the day. This feeling of satisfaction is amplified if the engine answers to the throttle and pulls in the field as though it took a real interest in its work. In the case of an engine that has been in use for any length of time these results are not obtained without trouble, but it is surprising how long an engine will keep in good condition if it receives consistent attention, and all adjustments are carried out as soon as they become necessary. Apart from the actual breaking of a vital part the diseases from which an engine suffers can be classified, roughly, under the general name of troubles, as follows:—Ignition, fuel supply, lubrication, valves, and water circulation. To this list of evils may be added knocking or noisy sounds, which are not evils in themselves, but are simply warnings that all is not well.

### Ignition.

It is of vital necessity to keep the coil or magneto free from damp, because if the condenser becomes damp it will not only cause leakage and failure of the ignition, but will not hold any charge, and the resulting spark will not be efficient. Great care should always be taken to avoid spilling water over either coil or magneto, and should any be spilt thereon it should at once be mopped off, and, if necessary, dried off by warm air from a lamp or stove, but care should be taken not to raise the temperature of the part so much as to melt the wax or shellac insulation.

I will now deal with some of the more common troubles experienced with ignition systems. The driver who knows his engine occasionally detects an alteration of its note or an interruption of its regular hum. This, if accompanied by a falling-off in power, is probably due to occasional or persistent missing of one of the plugs. When compression taps are fitted it is easy to locate the faulty plug. If all the plugs are firing badly the fault may be either in the petrol supply or in the ignition. If only one plug is missing the trouble can at once be set down to ignition alone, or, on

rare occasions, to a valve being stuck open. Apart from actual damage to a plug by breaking the porcelain or other insulation, there are three main evils from which it may suffer. Short-circuiting may take place between the points and the body, due to the hot spark having melted the metal. The gap of the plug may be too wide; it should not be more than about 1-50th of an inch, or, roughly, the thickness of the average thumb-nail. If the engine misses when running at small-throttle openings the points of the plugs should be set a little farther apart, whereas, if missing takes place at full-throttle openings the points should be set closer together. The third evil is due to sooting up, and is cured by cleaning with a little petrol. An occasional cause of missing is through having the points set in a pocket in the valve cap. This pocket remains full of spent gas left during the exhaust stroke, and a considerable improvement can be obtained by fitting plugs with a longer reach.

### The Magneto.

The magneto may be the cause of irregular firing in any or all of the cylinders, but tampering with a magneto is a pastime not to be recommended unless a driver understands it. There are two points, however, to which occasional attention is required; these are the high-tension distributor and the contact breaker. This distributor disc should be cleaned occasionally with a cloth and a little petrol, and the disc wiped over afterwards with a trace of oil. The contact breaker is the most important part of the mechanism. The space between the platinum points when they are separated should be about 1-64th of an inch, and any variation from this may cause ignition trouble. The contact points should be trimmed when necessary with a very fine file, so that they bend together level when closed, but they should not be trimmed unless the points are uneven. Oil should not be put on the platinum contacts or it will cause them to burn away rapidly. Occasionally the lever to which the moving point is attached works stiffly, allowing the points to remain apart; in such a case the fibre bush should be eased slightly. Oiling is of no use, as it may make it swell more. If these various points receive proper attention there is little to go wrong. A few warnings concerning magnetos:—

Don't run the engine with a plug wire disconnected—you may ruin the insulation. If you want to cut out a cylinder short-circuit the plug—that is, connect it directly to the metal of the engine.

Don't swamp the magneto with oil; two or three drops of good oil once a week are sufficient.

Don't oil the contact breaker.

Don't use an oilcan with dirt on the spout.

Don't file the contacts more than is absolutely necessary.

Don't hold the contact breaker to prevent the spindle turning when tightening up the nut of the driving coupling.

Don't fail to see that the earth wire is not making a short-circuit.

Don't hang plug cables on the exhaust pipe.

Don't replace plug wires on the wrong terminals.

Don't tamper with a magneto unnecessarily.

### Motor Fuels.

Every driver knows that if petrol is poured on the hand it evaporates with a marked cooling effect, due to the petrol extracting heat from the hand. In a carburettor fuel is supposed to be split up into a fine spray, and the heat for its vaporisation is extracted from the air. Any cracks or leaks in the pipe which heats up the air to the carburettor should be repaired at once. The jets in a carburettor are usually very small, and it is very necessary that all the fuel should be carefully filtered before it is put into the tank; as an additional precaution there should be a filter between the tank and the carburettor. These filters should be cleaned regularly, and any drops of water found therein carefully blotted up. "Popping back" into the carburettor indicates a weak mixture, and is one of the first symptoms of fuel-supply trouble. Such a mixture burns slowly, and may still be burning when the inlet valve opens, thus allowing some of the burning gas to rush back into the carburettor. If the engine has been running normally and popping suddenly develops, look for some stoppage in the fuel supply. First try the float needle, and if the petrol does not flow into the float chamber, although there is plenty in the tank, there is undoubtedly a stoppage in the pipes or the filter, both of which should be thoroughly cleaned. Such stoppages are frequently caused by small particles of scale from the tank, pieces of waste or fluff, or by drops of water which

will not pass through the filter or the jets. Many engines have a tendency to pop back when first started, from cold, but work satisfactorily after they have run a little time and become warm. The explanation of this has already been given in the paragraph dealing with hot-air supply.

Occasionally a float sticks or is held up by grit, or the needle becomes bent or jammed, causing the carburetter to flood. Flooding may also result from a punctured float, in which case the petrol can be evaporated and driven off by immersing the float in hot water, and at the same time the issuing bubbles will show the position of the hole, which should then be soldered neatly, or, in the absence of solder, a temporary repair can be made by wiping a piece of soap over the hole. A leaky joint in the inlet pipe may cause much trouble by weakening the mixture, and in an old engine leakage of air along the valve stems, due to wear in the guide, may have the same results. All joints should therefore be kept tight and leakages stopped as far as possible.

Very briefly, fuel-supply troubles and their remedies may be summed up as follows:—

**Engine Pops Back and Stops.**—No petrol in tank, petrol pipe choked, filter stopped up, or water in petrol.

**Engine Pulls Badly on Hills.**—Insufficient heating or jet too small.

**Engine Flabby and Exhaust Offensive.**—Jet too large, causing rich mixture.

**No Acceleration and Engine Stammers when Throttle is Opened.**—Engine cold or mixture too weak.

**Carburetter Floods.**—Needle valve sticking, dirt under needle, valve or float punctured.

**Consumption Excessive.**—Engine or transmission in bad condition, jet too large, ignition retarded, leakage of petrol, or brakes binding.

Let me here give a word of warning to drivers. A carburetter is a delicate piece of mechanism, but if properly fitted and treated carefully it rarely gets out of order. No driver should be misled by an engine knock to believe that there is something wrong with carburetter, as in no circumstances can this be the case. Again, many drivers always blame the carburetter if an engine suddenly heats up, whereas the probable cause is that the fan belt is slipping, that there is no water, that the water-jacket is choked up, that more oil is needed in the crankcase, or because the ignition is retarded too much. Overheating is never caused by too much gas.

### **Lubrication.**

Lubrication means the introduction of a separating film of oil or grease between two parts of a machine which have movement one upon the other. If the moving parts make actual metallic contact the surfaces will soon become roughened to such an extent that they may seize. The higher the speed of rubbing the sooner seizure will occur, and its consequence will be more serious. Some parts of motor vehicles are designed so as to create friction, but such parts are few, and are for special purposes—such as the main clutch, the brakes, the fan belt, and the tyres. Of all the sources of friction in an engine that of the piston against the cylinder wall is the largest item, and is double or treble the total friction of all the other parts of the engine put together.

### **Valve Troubles.**

Valve trouble is usually indicated by a gradual falling off in power. On examination the valve faces will be found scored and pitted, and it is necessary to grind them down on to their seats to again produce a clean face. If the face is very deeply pitted it may be necessary to clean it up in a lathe, after which it should be ground to a true bed on the seating. In an old engine the seatings themselves may become rough and necessitate truing up with a special tool, or, if not too bad, an old valve can be used for this purpose with a slightly coarser grade of emery, finishing off with fine emery and the proper valve. The operation of grinding is a perfectly simple one, but requires to be done with care. Only the very finest flour-of-emery powder, mixed with lubricating oil to form a thin paste, should be used. This should be spread evenly on the valve face, and under a slight pressure the valve turned first in one direction, then in the other, occasionally lifting it and turning it through about half a turn before letting it drop on the seat again. This is to prevent the emery getting into tracks. If a light spring is slipped under the valve head, and is long enough to lift the valve from its seat, it will be found a great convenience, as on relieving the grinding pressure the valve will be lifted and

it can then be twisted as much as is necessary before pressing down again. The exhaust valves suffer most, due to the hot gases sweeping across their faces, and it is for that reason that one usually allows a little more clearance for the exhaust valve tappets than for the inlet valve tappets so as to make quite sure that the valves really do close. When grinding in valves, it is, of course, necessary to take care that none of the emery paste enters the cylinder or gets on the valve stem, and the valve, valve port, and guides should be thoroughly cleaned before assembling the parts, oiling the valve stems during the process. After regrounding valves it is usually necessary to readjust the tappet clearances, carefully tightening up the lock nuts so that they cannot work slack. Each valve should be examined in turn to make certain that it is never held off its seat, nor has too much clearance—the clearance should never be less than 1-64th of an inch, and never more than about 1-32nd of an inch—but in order to get the quietest and best running it is advisable to adjust the tappets while the engine is still hot and the valve stems expanded to their maximum amount. It is not always easy to see if the clearance is right, especially if the head of the valve tappet is much bigger than the end of the valve; the tappet head may be a bit soft, and the end of the valve then punches a slight depression into it, so that the clearance is really more than it appears to be. It is, however, always preferable to have too much rather than too little clearance, as, although the engine will be noisy, there is less fear of burning out of the valves.

If for any reason a camshaft has to be removed careful search should be made for any marked teeth, and care exercised that the teeth of the timing gears are again correctly meshed when putting the camshaft back again. Occasionally a valve sticks in the guide, due to insufficient lubrication, or it may be that the valve stem has warped. If a spot of oil on the stem is not sufficient to make it operate again the valve should be removed and the stem rubbed down with a piece of emery cloth, or, if badly warped, carefully straightened in the jaws of a vice, after which it may be necessary to regrind the valve on to its seat. If the engine is provided with screwed valve caps the threads should be smeared with graphite and oil before replacing the caps, otherwise they may seize and be very difficult to remove. A driver should make quite sure that these are screwed up quite tight and that there is no leakage. A simple test for leakage is to pour a little oil round the joint when the engine has been started, when any leakage will be at once apparent by the oil being blown away from the joint.

### Cooling.

In small engines it is possible to rely on air-cooling, as on motor-cycles, but in larger engines a water-jacket is provided, and water circulated through this either by pump or natural circulation. In most cases it is usual to provide a fan to assist the cooling of the water as it passes through the radiator, and the fan belt should be kept at the proper tension, otherwise there will be slip. Water-cooling troubles make themselves evident by steam being generated, but so long as steam is not blowing away, even if the radiator is uncomfortably hot to the hand, there is no danger, as an engine works best when the water is just below boiling point. Like most complaints of engines, overheating may be of gradual growth, or it may develop suddenly. In the former case it means that the water-jackets and radiator have become coated with scale such as we find in a domestic kettle, except that the scale may also include rust and grease. Scale interferes with the passage of heat to a very great extent, but much of it may be removed by filling the jackets with a hot, strong solution of common soda, then, after leaving it to stand all night, drain it off and thoroughly wash out with clean water. Soda must not be used if the radiator or pipes are made of aluminium, because soda is injurious to this metal. In such a case it is better to use boilerine tablets or a solution of carbon tetrachloride. If overheating shows up suddenly on an engine that has previously given no trouble we must look for a broken or slack fan belt, a faulty pump, or leaking joint allowing water to escape, or the accidental opening of a drain tap. The most serious cause of overheating, however, is a cracked cylinder, as a very minute crack will allow gas to escape from the cylinder into the water-jackets, and the water will quickly boil. Some drivers appear to have difficulty in making tight joints in rubber connections, but if a little rubber solution is smeared on the pipe it will not only act as a lubricant, but when it sets it will ensure a good joint.

### Transmission Gear.

The transmission gear commences with the clutch and finishes at the road wheels. The two main portions of a clutch should disengage positively when the clutch is out, so that there is no dragging on the gear-shafts. If the clutch becomes greasy it

will slip, causing heating, and probably burning the lining, while if it is allowed to become fierce it makes starting difficult and throws undue load on the transmission system. A slipping clutch may be caused by insufficient spring pressure, the lining being badly worn, or worn so as to leave a ridge which prevents the cone entering any farther, in which case the ridge can be removed with a chisel, sharp knife, or file. If none of the above causes is present but the clutch still slips, a new lining should be fitted as soon as possible. Meanwhile, as a temporary expedient, thin strips of metal can be inserted underneath the lining between the rivets. A fierce clutch may be caused by too much spring pressure or by the rivet heads standing proud of the lining, in which case the clutch will slip a little at first and then take up suddenly. The remedy is to drive the rivets farther in with a punch, so that they are below the surface of the lining. Another and frequent clutch trouble arises from the centre or spigot bearing becoming so worn as to allow the clutch cone to sag and fall out of truth with the flywheel. This makes gear-changing a very difficult matter, because the clutch is never really free. If a clutch slips badly the first thing to do is to wash the lining with petrol, and if the lining is of leather it should then be reconditioned by dressing it with castor oil or collan oil and leaving it to stand disengaged overnight, so as to allow the oil to soak in. If, however, the lining is of fabric no oil should be put on it. As a temporary measure for a slipping clutch it should be dusted over with fuller's earth, or, in the case of a fierce clutch, with powdered graphite, or French chalk.

Multiple-disc clutches are now frequently used, some of them being enclosed in an oil bath whilst others are of the dry type. In the oil-bath type the case should occasionally be drained and washed out with paraffin and new thin mineral oil then put in. If thick oil is used it is liable to become sticky, and may cause slipping, whilst mixtures of engine oil and paraffin should never be used. Between the clutch and gearbox many vehicles are provided with a small brake or clutch stop, the object of which is to bring the rotating parts of the gearbox to rest when the clutch is out, so as to make gear-changing easy. Attention should be paid to this small brake to see that it is neither too fierce nor too slippery. The next link in the transmission is the change-speed gearbox. It should be supplied with the right quantity of suitable oil and occasionally drained, washed out with paraffin and a supply of fresh oil then added. This cleansing and replenishing is necessary because, no matter how carefully used, fine particles of metal dust or chippings become separated from the gears, bearings, change speed forks, &c., and if allowed to accumulate they cause extensive damage. The ideal lubricant is a good heavy mineral oil, but unfortunately some boxes will not retain it, and in such cases it is a common practice to mix oil and grease together; neither must be of the kind which produces a soapy mixture, because this implies the presence of acid, which will etch highly polished surfaces and cause damage. As a general rule the thinnest mixture of lubricant the box will retain should be used, not only because it flows freely to every part, but because it offers less resistance to the gears.

From the gearbox the drive is transmitted to the driving wheels through chains or a propeller shaft to the rear axle. If chains are used it is useless to attempt to lubricate by pouring oil on to them. The only effective way is to remove the chains, wash them thoroughly in paraffin, drain them, and then soak them in a bath of hot grease and graphite, and again drain them. Any excess of grease should then be wiped off, or it will collect dust and grit. If chain-cases are provided they should be maintained in an oil-tight condition, and the oil kept up to the proper level. The chains should be kept at a proper tension—a little slack, but not slack enough to flog. If universal joints are not properly lubricated wear will take place, and backlash develop and damage all keys and gearing. The back axle or differential case requires the same attention as is given to the gearbox. If pieces of metal are found on filtering the oil drained from casings something is wrong, and the matter should be reported at once or serious damage may follow.

### Conclusion.

As a final word let me add that the best possible way of reducing the cost of maintenance of a tractor is by giving close attention to the matters which I have mentioned. If this is done, and the brakes and steering connections are kept properly adjusted and all nuts and bolts kept tight, there is little to go wrong in a modern machine, apart from fair wear and tear, calling for the replacement of worn parts by new ones. If the care which I have advocated is not given regularly abnormal wear and tear will take place, heavy costs for renewals will be incurred, and the value of the machine will rapidly depreciate. I would again urge owners of tractors to treat their machinery as they would treat their animals. If they do so they will find themselves well repaid.

## SAVING TIME IN TRACTOR PLOUGHING.

### HOW TO LAY OUT IRREGULAR FIELDS.\*

In accomplishing the world's greatest task—that of ploughing the soil—adverse conditions are more often met with than those which are ideal. It is one thing to turn a large acreage during the first few days with a tractor ploughing outfit in a large, level, and regular-shaped field. To secure a high average daily performance for the completed job with the same outfit in a hilly and irregular-shaped field is quite another matter. A careful study of any given field with reference to the best way to lay it out for tractor ploughing will pay big dividends in quality of work for the finished field, saving of time, and lessening the wear and tear on the machinery—not to mention the added satisfaction to the operator. The writer has given close study to this problem for many years. The result of this study has been the development of a simple method of laying out fields which is applicable with equal facility to all manner of fields as regards size, shape, and topography. In short, it has become generally recognised by the power farming fraternity as the most satisfactory method yet devised, and is so recommended by all the manufacturers of tractors and tractor ploughs who have given the method a fair comparison with other methods. It offers a workable way to plough any field to satisfactory completion, which is at all adapted to power farming. With the newer and more powerful tractor models now coming out, there are very few fields which cannot be tilled with mechanical power. The method, in brief, is a plan of ploughing around the field instead of "in lands." Hills and irregularity of shape offer no obstacles, as we shall see, and under seemingly very bad conditions, the field can be ploughed economically with a tractor outfit.

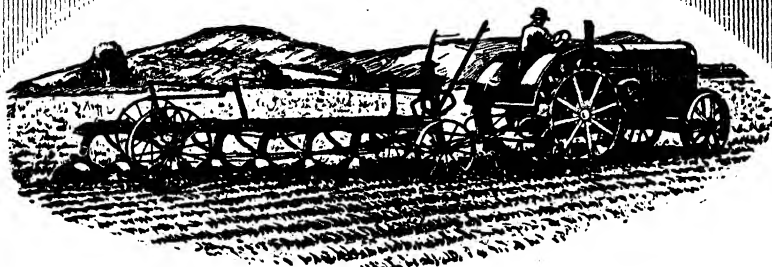


PLATE 105 (Fig. 1).—SHOWING HOW A TRIANGULAR FIELD IS LAID OUT, WITH LOCATION OF TURN STRIPS. CONSECUTIVE FURROWS ARE NUMBERED.

### Horse Ploughing.

Any farmer who has used horses for ploughing, following the usual custom of beginning at the outside of the field and going round it continually until finished, knows the following facts about this method of horse ploughing:—That it is the quickest way to plough any field completely; that one will always finish in the centre of the field, regardless of its size and shape; that there will be no odds and ends left to plough afterwards; that it makes the least number of back furrows and dead furrows; that it requires no need for staking out and measuring distances; and that its main objection lies in the fact that the horses tramp the life out of the freshly turned soil in the turn rows which lead away from each corner.

\* Reprinted from "The New Zealand Farmer" for August, 1928, and taken originally from an article by J. L. Ahart, in "The Field Illustrated" (U.S.A.).



## *Cross Proves Superior in Efficiency and Economy*

PARKDALE,  
BOGAN GATE, N.S.W.

*31st January, 1928.*

"I have been a 15/30 McCormick Deering tractor owner for many years, and I have subjected each and every fuel and oil to proper tests in order to gain the knowledge as to which gave me the greatest satisfaction from an all round point of view, the principal factors of which being engine efficiency with greatest economy of running. Cross Kerosene has proved itself superior in every way and seems to maintain its standard quality always, never varying as other fuels seem to do. Suffice it to relate that I can get more work per gallon from Cross than is possible with other fuels."

(Sgd.) A. W. HILL.

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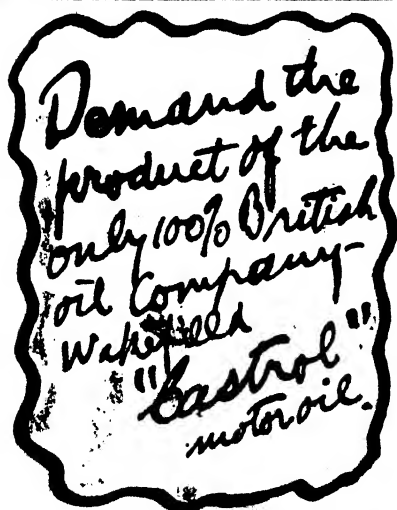
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### Power Ploughing.

The same man will recognise as the chief limitation of a tractor ploughing outfit its inability to turn an inside corner successfully with the plough in the ground after the first round is made. He will say that tractor ploughing would be ideal if this problem were solved—if one could plough around a field with a tractor, and at the same time eliminate the one serious objection he has to this method of horse ploughing. In some communities, the horse farmers consider the packing of the soil in the turn rows a very serious objection, and for this reason they plough their fields by marking out lands and ploughing each of these separately, even though they lose the many advantages of ploughing around the field. The power farmer has generally used the same method of ploughing out lands with his tractor from the start because he has known no other way to meet the difficulty just mentioned. Another reason why tractor ploughing is almost always done by cutting up a field into lands is that the thousands of tractor-interested farmers who have attended the many large tractor ploughing demonstrations held during recent years have always observed that the demonstration ploughing was always done by this method. It was natural for one to think that if a better method of ploughing existed, the manufacturers of tractors and ploughs would surely use it for sales demonstration purposes.

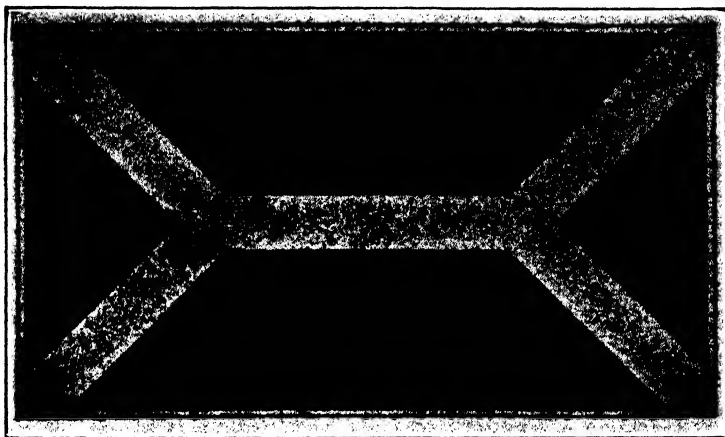


PLATE 106 (Fig. 2).—TURN STRIPS IN RECTANGULAR FIELD.

### Limitations of the Machine.

The power farmer who has used his tractor by ploughing out lands knows the faults and limitations of the method. He knows, who should know, the cost in loss of time that results from travelling a number of times over the same ground on the head lands with the plough out of the ground. This loss can easily amount to 10 per cent. of the total time spent in ploughing the field. He knows the difficulties which are sure to follow if the lands are not accurately staked out, one of which is the inevitable floundering around on the ploughed ground with the outfit to finish the point rows in midfield. Perhaps he has given up trying to do a neat job of ploughing with the tractor in his more irregular shaped fields and use a horse plough to finish up the odds and ends. When the fields are undersized and very irregular, would it not be best to do the whole job with the horse outfit, he comes to ask himself. And he finally does it as a matter of better judgment. If we accepted the method of ploughing out lands as the best way to use a tractor ploughing outfit we would not be keeping pace in this important regard with the rapid advance which has and is signalling the tractor farming industry.

Through experience as a farmer in a hilly section of the country, the writer has met about every problem which can confront a man while ploughing with a tractor. He realised some years ago while demonstrating for one of the largest manufacturers that something different would have to be done if the power farmer was to have a method of ploughing which he could use in all his fields, regardless of their size and shape. To be definite and usable, any new plan would have to be based on true engineering principles and yet be so simple that the average operator could appreciate its advantages after a single trial. Ploughing around the field offered the

necessary advantages. It only remained to solve satisfactorily the corner problems of a tractor outfit. Strangely enough, it was while serving as a field artillery officer in France that the writer hit upon the simple idea which was put to use immediately upon returning to the farm and made to serve as the basis of a new and better method of laying out fields, which for want of a better name has become known as the Ahart method.

When a field is ploughed by going around it, the turn rows always exactly bisect the corner angles and these turn rows always meet in the centre of the field area. Now instead of attempting to make the corner turns with the plough in the ground, why not determine beforehand where the turn row will fall, mark the turn row off suitably, and lift the plough as the turn is being made. If we mark off by ploughing a shallow furrow a turn strip which will bisect the corner angle, the plough may be lifted as it comes up to the mark furrows each time and effect a neat job. It can be dropped into the soil again at the shallow furrow which marks the other side of the turn strip. If the ground is covered with much trash or a cover crop, simply running the tractor through the weeds or growth will serve as a mark. The turn strips are ploughed out after the body of the field is completed.

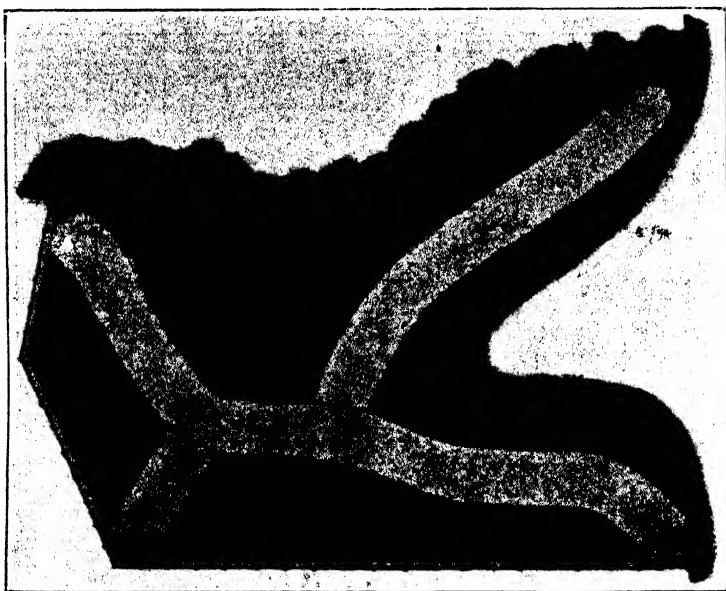


PLATE 107 (FIG. 3)—TURN STRIPS IN IRREGULAR FIELD.

#### A Simple Method.

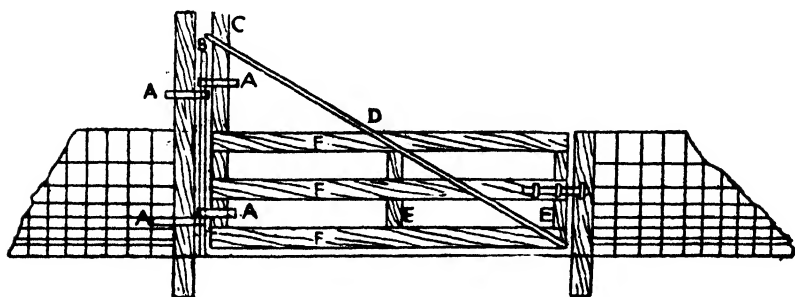
To locate the turn strip accurately a very rapid and simple method is used. The operator stands in the corner and measures the angular distance between the fences forming the corner. This may be quickly done by extending the arm horizontally and using the breadth of the hand as a measure on the horizon. After finding the number of times the breadth of the hand will lie on the horizon between the fences, the half number will obviously locate the bisecting point. Some well defined object in the distance will be on or very near the bisecting line and this is taken for a guide when marking out the turn strip. There is no pacing or staking necessary. The determination may be made from the tractor platform if the machine is stopped in the corner and it requires only a few seconds. The turn strip should commonly be made about 35 feet wide, although this will be determined by the turning radius of the tractor and whether the ground is on a slope. The idea is to have the necessary width so that a comfortable turn can be made. The steeper the slope the wider the strip should be made to allow for the tendency of the outfit to slide while turning. All the turn strips are laid out for a few hundred feet away from each corner while the first or second round is made. Afterwards, the turn strips are extended as the field is brought to completion, and they will meet in the centre of the field.

By referring to Fig. 1, in which the furrows are numbered consecutively as they are ploughed, it will be seen just how the field is laid out and the ploughing started without any lost time or unnecessary travelling. Figs. 2 and 3 show the location of the turn strips in a rectangular and very irregular field, respectively. It is noteworthy that if the two fields shown in Figs. 2 and 3 have the same area, they will be ploughed in the same time by this method. In the case of the field in Fig. 3, tractor ploughing would more than likely be disappointing in point of time consumed and quality of work if ploughing "in lands" is attempted. Note also that no turning is done on the same soil twice. This does away with objectionable packing, especially when the soil is damp. Furthermore, if the plough should not function properly when being dropped in at the farther mark furrow, it will not matter, as the next time around will work out the irregularity on account of the furrows constantly getting shorter. When this occurs while ploughing "in lands," the irregularity stays in the furrow until the finish where it leaves a patch that is difficult to finish neatly. Figs. 2 and 3 also show the proper relation of the turn strips for rapid ploughing out to finish the field. The general rule is to combine the turn strips for ploughing out whenever possible. With this in mind, the shorter legs are ploughed out first so that the turns at the inside end can be made on the unploughed land of the main combined turn strip. The amount of dead furrow will only be the length of the turn strips. When ploughing the next time, a strip is back furrowed around the outside of the field to keep the soil level along the fences. This is easily accomplished as one may go around the field in either direction after this method. Also, the turn strips may be laid out the second time slightly to one side of the previous ploughing in order to fill the old dead furrows.

When once the simple fundamental details of this method are learned in practice, the method will be found equally adopted to any field, and the saving in time and fuel will be very noticeable over any other method of ploughing. The only condition yet found where the method is not advisable is in the case of low, poorly drained land where many dead furrows are wanted for drainage.

### A SIMPLE AND SOUND GATE—MADE ON THE FARM.

The construction and the satisfactory maintenance of gates, especially where the number of them necessarily is large, represents a big problem on the farm. Perhaps the above sketch from an American agricultural newspaper will afford



some ideas to readers. The description of the parts is as follows:—AAAA, four eye-bolts, made from  $\frac{1}{2}$ -in. round iron, with threaded ends for nuts, and eyes large enough to admit a  $\frac{1}{2}$ -in. water pipe or rod. The eye-bolts in the framing post, C, of the gate rest upon the eye-bolts in the fence post upon which it is hung, forming a hinge. B is a piece of  $\frac{1}{2}$ -in. pipe used for a hinge pin, not fastened anywhere, one end resting on the ground. C is the framing post, 4 by 6 by 8 ft. long. D, the brace rod, is made from an old piece of  $\frac{1}{2}$  in. pipe, with a nut at upper end to draw up gate when desired. EE are two framing pieces, 2 by 4 in. F is 1 by 6 by 12 ft. boards, making the gate 12 ft. wide. For the fastener the maker used a piece of  $\frac{1}{2}$  in. round iron, drove a large staple in the fence post, and two in the gate, making a regular bolt. Then he gave the gate and all the trimmings plenty of paint. The post on which it is hung is a good, heavy one, 5 ft. in the ground, with plenty of stone tamped in around it, and then poured full of cement.

## TRADE CLASSIFICATION OF PIGS.

E. J. SHELTON, H.D.A., Instructor in Pig Raising.

*To secure the maximum profit in the production and marketing of various grades of pigs, it is essential that the farmer should have a detailed knowledge of trade classification, and of the requirements of the buyers representing both proprietary and co-operative bacon factories, the fresh pork trade, shop and retail trade, or the general buyer who attends and operates at store or market pig sales. The requirements of fellow farmers who depend to an extent upon the purchase of store pigs for further fattening are worth careful study; while in the stud pig business one needs quite an expert knowledge of the various breeds and of breeding and feeding, together with an equally extensive knowledge of the exhibition of stud pigs at shows, and of the business side of the trade in so far as it relates to membership in the Stud Pig Breeders' Society, correspondence, recording of pedigrees, advertising, despatch of selected pigs, and so on. These and other interesting points are discussed again by Mr. Shelton in the following article, which is largely a reprint (in response to numerous requests) of notes on the same subject which appeared in the Journal for August, 1927.—Ed.*

To secure the greatest margin of profit in the actual marketing of the animals it is necessary that they be properly developed and "topped up" on suitable and sufficient foods, this especially so three weeks or more before actual despatch, and that at the time of final preparation for marketing they be correctly classified and graded. The final preparation for market is particularly important, as on this so much depends; nothing is more annoying than to see well bred and well fed pigs offered for sale in a filthy condition, covered with mud (and sometimes with parasites such as hog lice) and confined in pens equally muddy, filthy, or dusty.

It is the right of every producer to see that the goods he has to offer for sale are placed before the buyers in the most attractive manner possible, and that they be delivered with all care and expedition to the buyer at point of local or terminal despatch.

### Market Classification.

In the actual sale of pigs by public auction or private treaty, a number of different grades are provided for, each of which has its own particular classification, the pigs being graded according to quality, approximate age, estimated or actual live weight or estimated or actual dressed weight (as the case may be), and approximate value.

The following table, which sets forth the names, ages, approximate weight, and value of market pigs will therefore be found very useful as a guide in the actual preparation of these animals for disposal and despatch. The figures quoted are approximate only, as trade requirements vary from time to time, and in different districts, States, and countries; they are quoted more as a guide than as a price schedule.

The demand for pigs of all ages and grades is being well maintained, and there appears to be no occasion to suggest a weakening of the demand, since as yet our local markets are not continuously fully supplied, and as yet we have no regular export of bacon and ham, or of frozen or chilled pork to markets overseas. Indeed, there has been quite an appreciable import of pig products from New Zealand, and this matter is the cause of some concern both here in the North, and in the Southern States.

## TRADE CLASSIFICATION, QUEENSLAND, AUGUST, 1927.

## PIGS.

Name or Grade of Animal.	Approximate Age.	Approximate Weight.	Approximate Value per Pig.
Sucker or Sucking Pig ..	6 weeks ..	15 lb. dressed ..	10s. to 12s. 6d.
Weaner Pig .. .. .	8 weeks ..	25 to 30 lb. alive ..	15s. to 20s.
Slip Pig .. .. .	10 weeks ..	30 to 35 lb. alive ..	20s. to 25s.
Store Pig .. .. .	12 to 14 weeks	45 lb. alive ..	20s. to 35s.
Light Porker .. .. .	4 months ..	50 lb. dressed ..	40s. to 50s.
Medium Porker .. .. .	4½ to 5 months	60 to 70 lb. dressed ..	50s. to 60s.
Heavy Porker .. .. .	5 to 5½ months	80 to 85 lb. dressed ..	55s. to 60s.
Light Baconer .. .. .	5½ to 6 months	86 to 94 lb. dressed ..	55s. to 65s.
Prime or Medium Baconer ..	6 months ..	95 to 120 lb. dressed ..	65s. to 78s.
Heavy Baconer .. .. .	Up to 9 months	1st Grade—	from 50s. to 80s.
		121 to 135 lb. dressed	
		2nd Grade—	
		136 to 145 lb. dressed	
Backfatter .. .. .	Up to 4 to 5 years	3rd Grade—	£3 to £4
		145 to 260 lb. dressed	
Stag.. .. .	Up to 6 to 7 years	Up to 4 cwt. dressed ..	£1 to £3
Chopper .. .. .	Up to 2 years or more	Up to 3 cwt. dressed or over	£2 to £5
Boar .. .. .	Over, say, 5 to 6 months	Various weights ..	Boars are of little or no value as "meat" pigs

While it will be noted that values fluctuate a good deal, and while pigs of one grade might readily be included in another and perhaps better grade, it can be taken as a general rule that the principal demand is for the medium or prime weight animal, whether marketed as porkers or baconers, or included in other grades. There is with us here, in the North particularly, a very limited demand for very light porkers or very heavy pigs of any grade. The prime pig in good marketable condition with a firm yet mellow flesh and firm white fat is the one most in demand, and is one that under normal conditions is the most profitable.

## GENERAL DESCRIPTION OF MARKET AND STUD PIGS.

## Suckers or Sucking Pigs.

This is a trade class, and includes pigs up to six or even eight weeks old, in good marketable condition and fit for immediate slaughter as "sucking pig" for the week-end, Easter, or Christmas menu, &c. The demand for this class varies considerably with seasonal and local conditions, and is not sufficiently constant or lucrative to warrant being specially catered for by the farmer resident outside the metropolitan or city areas. Pig breeders having this class of pig for sale at Christmas (and "sucking pig" is, where finances will allow, almost a national addition to these menus) can usually dispose of them at remunerative prices with but little trouble. The most popular weight is 15 lb. dressed, although some customers ask for lighter or heavier weight carcasses.

## Percentage Deduction.

In general the difference between actual live and actual dressed weight—where the animals are weighed, slaughtered, and weighed again within two or three hours—varies from about 18 to 25 per cent. Most factories, however, find it necessary in actual practice and in ordinary routine to deduct much heavier percentages than these, up to 30 per cent. being a common deduction where the time elapsing between weighing alive and weighing when dressed covers twenty-four hours or more, and where there is a good deal of shrinkage in weight, the result of handling, sometimes rough handling, and transport over long distances to destination, and possibly a "rest" period of twenty-four hours more or less between arrival at the factory and actual slaughter.

Further details in regard to this portion of our subject may be had from the pamphlets dealing with "Marketing Pigs," which, together with many other nicely illustrated informative pamphlets on pig raising, are available gratis on application (written or personal) to the Department of Agriculture and Stock, Brisbane, Queensland. The various bacon factories will also be pleased to advise pig raisers in regard to any of these matters, as it is in their interests that their clients should be informed as fully as possible in regard to all matters associated with marketing &c.

### Weaners.

Dealing further with the various grades of pigs, we come to the trade class referred to as weaners. Pigs are usually weaned off the sow at about eight weeks of age. This is the correct age for weaning, though pigs benefit considerably by being allowed to run with the sow until the age of ten weeks. At this age they are sufficiently advanced (or at least they should be) to be able to care for themselves.

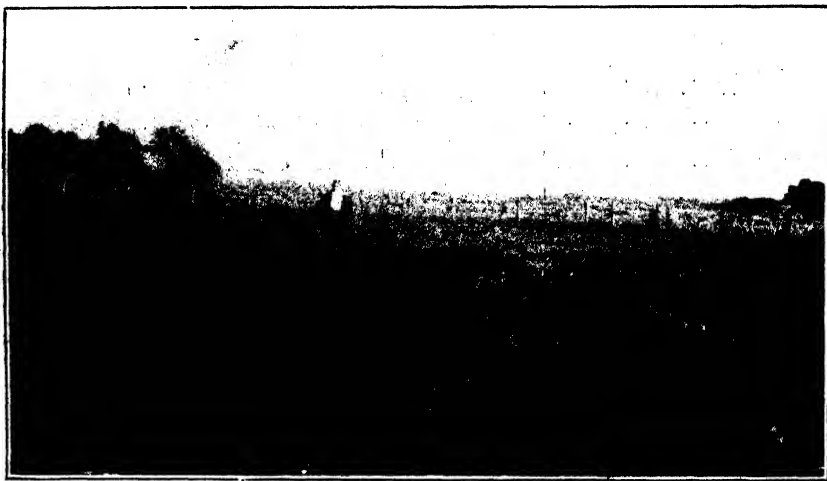


PLATE 108.—ALL AMONG THE PIGS.

A Pig Farm Scene in the South. Mr. A. N. White, of the Blakeney Stud, with a group of Poland-China and Berkshire Pigs, in one of the grazing areas attached to the Stud.

They should, however, have been taught to feed from a trough when four or five weeks old, so that by the time they are ready for weaning they will be quite accustomed to their own food trough and the class of food on which they are to be fed from then onwards.

Weaners are not a "trade" class in saleyards as far as butchers are concerned, but farmers trade a good deal with these young pigs, though even for this purpose slips or stores are a better line. It is not a good thing to wean pigs off their mother hurriedly and rush them off to the saleyards, as they frequently become so checked in growth as a result of the altered conditions that they fail to develop properly and become slow growers or even "stunted" pigs. Many young pigs are rushed off to the saleyards at six weeks old, and change hands at 15s. to 20s. each, a price that is scarcely a payable one to the buyer, unless he knows how to handle these pigs to prevent a check in their growth. It is but natural for a very young pig to fret for its mother at this age, and this fretting and fuming (crying as it were) all day long soon upsets the animal's nervous and digestive system with ill results. It is preferable to hold young pigs at this age for at least two weeks more before selling, as this enables them to become accustomed to the new conditions and the absence of the sow's milk from the daily menu. Pigs vary a good deal in weight at this age; some exceptionally well-grown animals weighing as much as 40 lb. or more alive. However, the general average would be about 25 to 30 lb.

### Slips.

After passing through the weaner stage and having been definitely separated from the mother, the young pig next becomes entitled to the trade term of a "slip." This is purely a stock salesman's or stockyard term, indicating that the pig is midway between the weaner and store stage. Many farmers prefer buying slips or stores, and growing and fattening them for market in preference to breeding them. Thus it is that there is usually a fairly keen demand for slips and stores, and thus also it often happens that they realise more in comparison than pigs that have already been fattened as light porkers. A "slip" is not a butcher's pig, and butchers do not handle them, except for fattening purposes. Most country butchers run their own piggeries, and they frequently have pigs of this description for sale. The value varies with the demand, but well-developed slips should be worth from 20s. to 25s. or more, if they have been well cared for from birth and are well bred. A little extra care in their preparation for sale and a little advertising as to their breeding, &c., helps considerably.



PLATE 109.—AN ATTRACTIVE TRIO OF BERKSHIRE-TAMWORTH CROSS BACONERS,  
PRIZE WINNERS OF THE BEST QUALITY.

The Property of Mr. P. Fett, of Westbrook Crossing, Queensland. These would be classed as Prime Baconers in the markets of the North, and as Light to Medium Baconers in the markets of the South.

With good feeding and management it should be possible to get pigs of this quality to Prime Bacon Standard at five months of age.

### Stores.

Passing through the weaner and slip stages, the young pig next becomes a "store pig," a stockyard term indicating, as it does in most other classes of live stock, that the pig is at an age when the owner must determine the animal's future, whether he or she is to be kept for breeding purposes, to be fattened as a porker, to be still further grown and fattened as a baconer, or to go into the heavier grades, or whether the pigs will be held for a week or two and be resold in the same grade to some other person or firm. The demand for store pigs for fattening purposes continues to increase annually, hence, provided that store pigs are in good, healthy, growing condition and show some breeding and quality, they can usually be disposed of to advantage by public auction at pig saleyards or by private contract, at prices varying from 20s. to 30s., or even 35s. to 40s. each. Store pigs to realise maximum values must be perfectly healthy, show good breeding and type, and be in clean, attractive condition ready for further development and fattening. Any "weedy" sorts or any pigs that have been injured in any way or are smaller than the others in the same pen should not be offered for sale in the same pen, as they will always affect the value of the other pigs offered, or of the better class pigs available. Suburban and metropolitan pig farmers, proprietors of "butter-milk" or "wey" piggeries (i.e., piggeries where butter-milk or wey are the principal items of purchased food) are constantly on the lookout for good lines of store pigs. They usually have no objection to the size or age of the pigs, except that they will not handle weaners or slips if larger pigs are available. The stores they like most are

those from three to four months old that have had good opportunity of growth, but that have had little or no fattening food—pigs that with four or five weeks' good "solid" food will "make up" into first-class baconers. For these latter sorts they will frequently pay more in comparison than the farmer can realise for porkers.

It is good business growing store pigs in quantity for sale as such, but one needs to be watchful of the seasons and food supply, otherwise one might be caught with a heavy supply of pigs on hand and little or no (or very expensive) food available. The ideal condition would be growing store pigs on the cheaper country over the ranges, and fattening them on the more expensive country capable of growing corn and other cereals, and root crops, &c., &c., on the coastal areas.

### **Light Porkers.**

Good quality well-developed pigs from four to five months old are usually classed as porkers, and they are graded according to weight, quality, and condition into three groups—light, medium (or prime), and heavy.

In the past in Queensland there has not been a sufficiently constant demand for porkers to have warranted farmers catering specially for these grades, but conditions are rapidly changing, and nowadays when the export of frozen pork is being given so much publicity, fresh buyers are offering, and a certain amount of frozen pork has already been shipped from Queensland to ports outside of our own borders and to overseas markets. One firm alone, during 1926, exported 2,800 porkers, purchased here at between 7d. and 7½d. per lb. dressed weight, at weights between 60 and 110 lb. dressed. The pigs arrived at destination in a satisfactory condition, and created a demand for further and almost unlimited supplies. It will be seen, therefore, that the porker grade is becoming an important one. There is, of course, always a certain quantity of fresh pork on the retail markets of this State, especially in the metropolitan area.

It is a mistake for farmers to send porkers to the bacon factory and expect the factory manager to grade them as bacon pigs and pay for them accordingly—that is, unless they are sent in by arrangement with the factories—for even bacon factories have a certain demand for pork, and in the far North the Northern Pig board handle porkers as well as baconers through the North Queensland Co-operative Bacon Factory. If there is a demand for them at a payable price, porkers, if properly handled, should be more profitable than bacon pigs, as they are ready for market much earlier, and consequently can be produced at a lower price and with less risk. The lighter grades of porkers—say, those dressing about 50 lb. weight—are not as profitable as the prime weight porkers (70 lb. dressed), except to the suburban farmer, who can deliver them to the saleyards or to retailers or consumers in a fresh, clean, prime condition. Porkers cannot stand knocking about to the same extent as pigs carrying more age and weight. To the farmer having porkers for sale the best advice would be to spend some time moving about among pork butchers, stock agents, hotel and cafe proprietors, suburban pig farmers, &c., ascertaining the exact position regarding the market outlet for these animals. See table for ages, weights, and values.

### **Medium Weight Porkers.**

For pigs of 65 to 70 lb. dressed weight there is, especially during the cooler months of the year, a good local demand. They are more profitable than either the lighter or heavier grades, and provided they are in good, healthy condition, will always realise top prices. Butchers prefer porkers weighing 65 lb. dressed if they can secure them regularly, because they are of a convenient and handy "shop" size, and can be cut up to more advantage than other grades. Porkers are, of course, used in the fresh meat business, being retailed in the form of small joints of fresh pork, pork chops, roast pork, and other forms. Many farmers believe that the bacon-curers can handle porkers to cut up for the sausage trade, but this is not the case, except as referred to above, as factory reports will bear out. In the Southern markets there is a heavy demand all the year round for porkers of good quality and of convenient "shop" weights.

### **Heavy Porkers.**

For these the demand is not so keen or constant, nor are prices as satisfactory. Altogether they are not as good for marketing purposes as are the medium weights or the better grades of light bacon pigs. There are times, of course, especially in the South, when heavy porkers sell well, particularly if one or more of the carcass butchers have heavy export orders for carcass pork for the Navy or for pickled pork for the "Island" trade. In general, however, it can be said that the heavy porker

is not in demand; he had better be fed for a fortnight or a month longer and be marketed as a baconer, in which class he will realise a price that should more than pay for his keep for this extra period. This is a point far too many farmers fail to realise; the general complaint amongst bacon-curers to-day is that farmers are rushing their pigs into market before they are heavy enough or carry sufficient condition for curing, this especially so in the Southern States, where there is a general "scare" owing to numerous outbreaks of disease among pigs, particularly in the metropolitan areas of Sydney and Melbourne.

#### **Bacon Pigs—Light, Prime (or Medium), and Heavy.**

As with porkers, the demand for bacon pigs centres more upon the medium and prime weight pigs than upon the lighter or heavier, overfat grades. In fact the very light bacon pig, like the overweight porker, is not desired. He shrinks heavily in weight while in transit, and loses condition very much more as a result of handling. A pig that is too heavy for the pork butcher, yet not heavy enough for the bacon-curer, is in a class that is likely to suffer more on a falling market than any other grade, therefore breeders who desire to secure bacon pig prices should aim at placing their baconers on the market when they are five and a-half to six months old at about 115 to 120 lb. dressed weight (on approximately 165 to 170 lb. live weight). The bacon-curer prefers a pig this size, because the carcass can be



PLATE 110.—AN EXCELLENT QUARTETTE OF BERKSHIRE PORKERS IN PRIME CONDITION.

Note the clean healthy skin and hair, the fine quality and even development of each animal, and the clean comfortable quarters under which they have their abode.

retailed more profitably in the form of ham, shoulders, flitches, middles, or sides. The heavy bacon pig is a better market animal than the heavy porker, because the former carries a more weighty ham, but he is not as profitable "all round" as the pig of medium weight, and should not be kept so long in the fattening yard or pen. It must always be remembered that the pig is a greedy feeder, and so long as he is feeding he is either doing so at a profit or at a loss to his owner. It pays handsomely to watch the markets carefully and to place before buyers the class of stock most in demand. The demand for bacon pigs is very keen, so much

so that bacon curers have buyers or agents operating in practically every district throughout the State; the competition is so keen that the farmer need have no fear that his stock will not realise market values. Good pigs always realise good current values; whether these values are profitable to the farmer or not is, of course, another question, and one that bears a direct ratio to cost of production and handling. See table for ages, weights, and approximate values.

### **Backfatters.**

The term "backfatter" is used by pig buyers to indicate that the pig has passed the stage at which he can profitably be handled as a bacon pig, and that having passed that stage his carcass must be "cut up" into smaller pieces and be used in the manufacture of the variety of small goods for which the carcass of the pig is justly famous. The term "backfatter" also indicates that the pig is a very heavy one, and that he carries the greater portion of his fat on his back or on the upper portions of his body. Backfatters fluctuate in value more than any other grade of pig, and as a class they can fairly be considered as unprofitable; still the class embraces a variety of heavy pigs, old fat sows, barrows, and very heavy bacon pigs that for various reasons might not have been marketed earlier. It would not pay under ordinary circumstances to breed pigs for sale as backfatters, but it certainly pays to fatten up brood sows that have become unprofitable, either on account of age or because they are unsatisfactory as breeders; it pays to cull and fatten up any sow that fails to produce a satisfactory litter twice a year, therefore the backfatter class provides a suitable market outlet for old heavy pigs or for fat pigs over the ordinary market weights. The price varies considerably according to supply and demand and the quality and condition. During the war phenomenal prices ruled for very heavy fat pigs, as much as £22 15s. having been paid at the Abattoir Saleyards, Homebush Bay, New South Wales, for a very heavy fat sow. Prices ranging from £12 to £20 were quite common, but during normal periods these prices are not heard of, though in the markets of the South (Sydney and Melbourne particularly) from £4 to £10 are quite common figures for prime quality backfatters. In Queensland, however, and in Northern New South Wales, these cannot be obtained, hence we have stated the value of backfatters as £3 to £4, a value within the reach of the farmer if his pigs are of sufficiently good quality.

### **Stags.**

Old sows are usually graded as backfatters, whilst old boars that have been castrated and fattened up are classed as "stags," and for them the demand is very limited. Stags are purchased for rendering down mostly, the fat goes into the manufacture of lard, the lean meat goes to the sausage tub, and most of the heavy gristly skin (the shield and wrinkly skin along the neck and sides) is cut away by the Meat Inspector and is condemned as unfit for human consumption. "Aged" stags rarely pay for the feed they consume.

### **Boars.**

It does not pay to market boars unless one has an abundant supply of very cheap food; they rarely realise more than from £1 to £2, and they will only realise these prices if they are comparatively prime and in good condition. Whether it would pay to castrate them and fatten and market as stags is a very debatable point, and one that can only be answered by the owner. It would not pay to fatten them upon purchased foods unless the food was very cheap and the market rates of pigs reasonably high.

Bacon factory buyers nowadays will not accept boars at all, and all "stags" are accepted only on condition that they have been "emasculated" (castrated) three months beforehand.

### **Choppers.**

Pigs that are marketed in a half-fat condition and that are unsuited to the requirements of the pork butcher, or the bacon curer, or for use as back-fatters, are usually classed as "choppers"; the term indicating that they are purchased for chopping purposes—that is, the carcass is chopped up into a variety of pieces and is used either for export as salt pork or pickled pork, or is used in the manufacture of small goods. Choppers vary in price according to their weight, condition, and quality. The class provides a very useful market outlet for a variety of pigs that could not be marketed profitably in the classes for which they might otherwise be suited.

### OTHER STOCK TERMS REFERRING TO PIGS.

Apart from the general classification of pigs for trade and market purposes, there is a breeding classification in which other terms are used to describe the pigs at different stages of growth.

Commencing at birth the young pig is variously known as a sucker, a pigling, a bonham, a piglet; or, in a group, he is part of a farrow or litter.

#### The Yelt.

Having passed the sucker stage the young female pig is called a "yelt" or "gilt" until she has produced her first litter. This term "gilt" is quite a common one among farmers from England, Scotland, Ireland, and Wales, but is not a common term in Australia.

#### The Brood Sow.

Having produced a litter, the yelt now becomes one of the matrons of the herd, and is henceforth known as a brood sow or as a breeder or breeding sow.



PLATE 111.—DOWN ON THE FARM.

The Piglet appreciates its bottle. A Domestic Scene on the Farm of Mr. R. Wight, Market Reports' Officer, Station 4 Q.G., Brisbane.

#### The Male Pig.

The boar usually retains his title throughout life. The male is often termed the "hog," but in America all pigs are called "hogs" (i.e., the hog industry); in fact, the Americans rarely use the term "pig" at all, and when they do use it, it is to describe suckers or very young stock. The boar does not actually begin his stud duties until he is ten to twelve months old, the sow also should be at this age before being mated.

The term "pig" is now, however, being generally accepted as the correct one for males and females of the "porcine" species, the term "swine" is gradually being dropped, and the term "hog" used to designate the male pig.

#### The Barrow Pig.

A male pig castrated whilst young is styled a "barrow." In American literature again both boars, barrows, and sows at the age of about four or five months are styled "shoats," but here they are called "store" pigs, and the term is a general one including all grades; a group of store pigs often includes breeding sows in poor or rough condition—in fact the group might include any class of pig in poor or half-fat condition.

**Runts.**

The "runts" of a litter are the small, weedy, or weakly pigs. They often do not pay for rearing, as they require too much special care and attention.

**Rickety Pigs.**

Pigs that suffer as a result of a long train or steamer or road journey and that arrive at the saleyards or factories "down" in the hindquarter, or that are unable to walk, or that walk with difficulty, are usually styled "rickety" or "groggy" pigs. The term is an erroneous one so far as its reference to the disease called "rickets" is concerned, although pigs suffering from rickets exhibit much the same symptoms.

**Scrub or Mongrel Pigs—i.e., The "Razorback" of American Literature.**

A scrub or mongrel is an animal of mixed or unknown breeding without any definite type or markings. Other terms used to describe mongrels are "bronchos," "razorbacks," "wild pigs," "bush pigs," &c.



PLATE 112.—FEEDING THE ORPHANS.

Mrs. Percy Campbell, of Duroc-Jersey fame, attending to the orphans on the farm at Lawn Hill, Lamington, via Beaudesert. Q.

It is scenes like these that illustrate the keen, intelligent interest Queensland's womenfolk have in farm affairs. A little extra care and attention mean much in matters of this description.

**Purebred, Pedigreed, or Stud Pigs.**

An animal that is included in this class is one of pure breeding, representing a definite, recognised breed, both of whose parents were purebred animals of the same breed. To be classed as purebred, live stock must be either registered, eligible for registration, or (in the absence of public registry for that class) have such lineage that their pure breeding can be definitely proved and recorded. To be of good type and quality, the animal must be healthy, vigorous, and a creditable specimen of its breed; its breeding must be pure.

In Australia the interests of the stud pig breeder are cared for and fostered by the Australian Stud Pig Breeders' Society, which organisation has branches in each of the States. The Queensland Branch Secretary is Miss J. Mackay, Inns of Court, Adelaide street, Brisbane, from whom, or from the Instructor in Pig Raising, further details re the operation of the society may be obtained at any time.

### Thoroughbred.

In speaking of pigs the term "thoroughbred" means the same as purebred. In American and English literature the term "standard bred" is also largely used. This is a term that we rarely use at all—it refers to the purebred animal.

### Crossbred.

This term applies to the progeny of purebred animals of different breeds—that is, a Berkshire boar mated to a Tamworth sow produces crossbred pigs; both parents are purebred pigs but of different breeds. The crossbred pig is very popular as a "meat" pig, and is produced for market purposes in practically every district where pigs are bred. Crossbred males should be castrated; they should not be permitted in the herd as sires. The crossbred sow, on the other hand, if of good type and conformation, makes an excellent breeding sow when mated to a purebred boar.

### Grade.

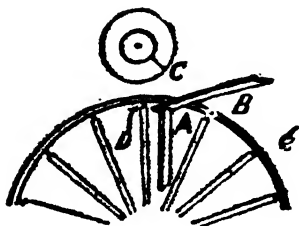
This term differs from that referred to above, in that it is applied to the progeny of a purebred boar mated to a crossbred sow. Sometimes the term "grade" is used where the progeny are from parents whose breeding is pure, but whose pedigrees for various reasons have not been recorded. The offspring of a purebred boar and a grade sow is also a grade, but through progressive breeding becomes a higher or better grade. When a Berkshire boar is mated to a crossbred Tamworth-Berkshire sow the progeny are called grades. A sow of the latter class mated back to a Berkshire boar frequently produces progeny to all appearances purebreds; they are sometimes called three-quarter breds, having as it were three-quarters Berkshire and one-quarter Tamworth blood in their veins.

Any further information in connection with the classification and marketing of pigs or on any other aspect of pig raising may be had on application to the Department of Agriculture and Stock, William street, Brisbane, Queensland.

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## TIGHTENING SPOKES.

An old device for tightening up buggy wheels which are beginning to rattle is shown in the illustration. A piece of 3 in. by 2 in., A, about  $\frac{1}{4}$  in. longer than the spokes of the wheel is set upright on the hub of the wheel alongside the loose spoke. A longer piece, B, 2 in. by 1 in., is rested on the upright with its end under the rim of the wheel, and the rim is raised from the shoulder of the spoke by the lever.



The leather washer, C, which has an internal diameter equal to that of the tenon of the spoke, D, and which is cut through from edge to edge, is placed around the tenon, D, and the rim is released on to the washer. As a rule only two or three spokes will require washering to get the wheel tight. If allowed to go on the wheel will soon be ruined as grit works into the joint and the friction set up soon wears away the tenon and the rim. The washer can be cut a little wider than the spoke and trimmed down with a knife.

**ABSTRACTS AND REVIEWS.**

*All foreign agricultural intelligence in this section, unless otherwise stated, has been taken from "The International Review of the Science and Practice of Agriculture," published at Rome by the International Institute of Agriculture.*

**Marketing Problems in England and Wales.**

STREET, A. W. (head of the Markets and Co-operation Branch of the Ministry of Agriculture): The Problem of Agricultural Marketing (address delivered at Kendal on 8th October, 1927). "Journal of the Ministry of Agriculture," Vol. XXXIV., No. 9. London, December, 1927.—Council of Agriculture for England: Improvement of Marketing of Agricultural Produce. "Journal of the Ministry of Agriculture," Vol. XXXIV., No. 9. London, December, 1927.—Marketing of Farm Produce: Interim Report to N. F. U. "Times," No. 44,743. London, 19th November, 1927.

The question of the marketing of agricultural produce is being widely discussed in England and Wales. On the one hand the improvement of agricultural marketing is advocated as a remedy for the existing depression in agriculture; on the other hand the efforts which are being made to induce the British consumer to give preference to the produce of the British Empire (including in the first rank the produce of England and Wales) has drawn attention to defects in the marketing of the home produce.

The Council of the National Farmers' Union set up last year a committee to inquire into the present and possible conditions of marketing farm produce with the object of devising a scheme for united action by members on a national basis in order to improve the economic condition of agriculture. This committee recently presented an interim report, which does not, however, contain any concrete proposals. It points out that the existing committees of the Council of the Union—the co-operation committee, the fruit and vegetables committee, the milk and dairy produce committee, the sugar beet committee, the live stock committee, &c.—are already dealing with marketing problems, and recommends that no change should be made in the system. The committee maintains that the present depressed situation of agriculture is largely due to the policy of deflation. This policy, it states, has hit agriculture particularly, since as a rule the interval between incurring costs and receiving the return is longer in the case of agriculture than in that of other industries. "No access of marketing skill," says the report, "could have availed to counteract the effects of deflation or to restore the price equilibrium."

The question of marketing has also been brought before the Council of Agriculture for England, and at a meeting on 20th October, 1927, the Council adopted the following preliminary suggestions put forward by the Standing Committee:—  
 "(1) That it is of urgent importance that the agricultural industry should consider the better marketing of agricultural produce in the light of the material now available, with a view to securing for the producer greater control over his product than he has at present. (2) That among the primary objects to be aimed at are closer touch with the consumer and better standardisation both in the quality and quantity of supplies: and that the services which might be rendered in these ways would entitle the producer to receive a larger share of the price which the consumer pays. (3) That, though the assistance of the State would be necessary in setting up the marketing organisation and machinery required for different classes of products, the movement must be primarily that of the producers, success being impossible without a guarantee of supplies. (4) That, in order that the producers should be willing to undertake the responsibility for initiating, setting up, and seeing through new marketing systems, they must be certain in advance that the profits accruing shall be secured to the industry. (5) That the question of benefiting the agricultural community by placing the purchase of wheat and meat, whether home-produced or imported, under national control deserves careful consideration." The Standing Committee was also instructed to prepare a report on the subject for presentation to the Council.

An important contribution to the discussion has been made by Mr. A. W. Street, head of the Markets and Co-operation Branch of the Ministry of Agriculture in an address delivered at Kendal on 8th October, 1927. Mr. Street maintained, like the committee appointed by the National Farmers' Union, that marketing reform is not a remedy for agricultural depression; it is to be regarded as a permanent and necessary improvement in business efficiency of service alike in times of prosperity or of distress. Nor does better marketing, in his view, mean replacing the existing machinery of distribution by a farmer-owned co-operative system.

Co-operation has, nevertheless, an important part to play, notably in the assembling of produce in the areas of surplus production. In average circumstances group marketing is, or should be, more efficient than marketing by individual producers, not only in regard to such services as the preparation, classing, grading, packing, and dispatch of supplies, but in the search for outlets and in the orderly feeding of markets. The ungraded contributions of individual producers must first be assembled in order to provide the bulk necessary for the grading process and for the maintenance of graded output. The present system of direct consignment by individual producers, or sale to local dealers who buy to send away, too often fails to ensure that home produce shall reach the large consuming centres in a form and condition and in large enough units to compete on equal terms with imported supplies. One way of meeting this situation is for producers to co-operate to render the preliminary marketing services for themselves. Collective marketing is a means to an end, but it is not the only means, and it is not essential to marketing reform. In many exporting countries organised assembling and the standardisation of product and package are done by merchants and exporters. Some form of organised assembling is an economic necessity, and if home producers are not disposed to co-operate for this purpose they should encourage and support any business enterprises that undertake to handle produce on up-to-date lines and place it in the hands of distributors in a form which accords with commercial requirements.

The greatest marketing problem which confronts the British farmer is that of devising a workable system for the standardisation of his products. If standard goods are to be marketed they must either be produced to standard or they must be graded into standard categories. For the marketing of standard farm products a standard grading system is essential, though it is possible for the producers of some commodities—e.g., cattle, bacon pigs, table fruit, or poultry—to simplify marketing by standardising their production types. This is a first step towards better and cheaper marketing. Standardised grading increases the speed with which business can be conducted. It provides a basis for selling in which inspection need not invariably precede purchase; it makes possible the accurate determination of values and the quotation of comparable market prices; it reduces buyers' risks, minimises disputes, encourages long-period contracts between sellers and buyers, widens the market, and in general facilitates sale from assembling points in producing areas to distributors in consuming centres. It facilitates credit accommodation and, in particular, the financing of such operations as storage. The standardisation of containers is also of considerable importance. Standardised grading has also an important influence on demand. Ungraded supplies, or supplies graded in a multitude of different ways, cannot make the same appeal to the distributive trades as standardised imported goods that can be handled in bulk and meet requirements in every detail. Moreover some method is necessary by which superior home-grown produce may be definitely distinguished from home produce of lower quality, so that good and bad may not be marketed under the same designation.

The Ministry of Agriculture has already suggested standard grades for a number of commodities, and demonstrated them publicly; others will be suggested and demonstrated as investigations proceed. Mr. Street suggests that a national quality mark, duly safeguarded against misuse, should be introduced as a special incentive to the rapid adoption of the proposed standard grades. It would be necessary to register individuals who were authorised to use the mark and to arrange for the sampling and inspection of consignments. The use of the mark would, however, remain entirely voluntary, and only those who wished to take advantage of it would be subject to the measures necessary to ensure that the mark was really a guarantee of quality and reliability. For convenience of administration it might prove desirable to delegate responsibility for controlling the use of the mark to area associations of producers and others concerned; each commodity would require a separate organisation for this purpose. The adoption of a national quality mark would greatly facilitate, as far as home produce is concerned, the advertising campaign which is being conducted by the Empire Marketing Board in support of produce grown in the British Empire.

### **Maize Marketing in South Africa.**

The South African Agricultural Union Congress. The Organisation of the Maize Industry. "The Farmers' Gazette," Vol. V., No. 154. Pretoria, 4th November, 1927.

Following on the conferences held during 1927 on the subject of the organisation of the South African maize industry (1), the Central Agency for Co-operative Societies, Limited, approached the Land Bank, offering to find the sum of £1,000 for the organisation campaign, the object of which is to induce maizegrowers to form a central co-operative sales agency, provided that an equal amount be granted by the

Land Bank. The Board of the Land Bank has replied in the following terms:— 1. The Board recognises the desirability of all maize being sold through one channel, in order to secure a reasonable return to the producer. 2. Propaganda work among individual growers of maize towards inducing them to join in some scheme which has that end in view is advisable. 3. The Board will be prepared to grant an amount not exceeding £1,000 to the South African Agricultural Union to be used solely for such propaganda work, provided that (a) the Central Agency for Co-operative Societies Limited as representing the co-operative maizegrowers provides a similar amount; (b) these amounts constitute a fund for propaganda among maize farmers on lines approved by the Board; (c) before any grant will be made, the Board must be satisfied that the South African Agricultural Union and the Central Agency for Co-operative Societies with the co-operation of the Department of Agriculture and the Bank have formulated a plan of propaganda which has a reasonable chance of success, and that the amount of £2,000 is sufficient to cover the expense of carrying out that plan. Negotiations between the Committee, the Central Agency, the Land Bank, and the Agricultural Department are proceeding.

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### FAT LAMB RAISING.

Lamb-raising may be regarded as a special branch of sheep-farming, the object being to produce a lamb with exceptional early-maturing qualities, and with a shapely, compact carcass of the proper weight at or before the weaning stage—five months. To the small wheat and sheep farmer the raising of fat lambs should prove a certain source of income if the conditions are suitable and if he employs the right methods. The flesh of prime lambs is worth, on an average, 1½d. to 2d. per lb. more than ordinary mutton, and it must be remembered that the lambs are disposed of at five months old.

The lamb required for the export trade is one which will dress from 33 to 40 lb., having a plump, symmetrical carcass with a good distribution of fat and lean, and as fine as possible in the bone. Lambs with the above qualifications are termed "firsts," while those weighing 28 lb. to 33 lb. are "second grade," and lighter weights "third grade." Heavier lambs than 40 lb. are not liked by the trade.

What is required is a plump, well-shaped, sappy lamb, weighing between 30 lb. and 40 lb. Slightly heavier weights are not objected to so long as the lamb is not dry and old, and lighter weights also will sell well if fat and plump, but "slab-sided," leggy lambs do not meet the requirements of the local market and only realise low prices. The main point is that the lambs must have plenty of bloom and this can only be assured by giving them the best possible conditions right up to the time they are trucked.

On account of coming direct from their mothers, lambs cannot be expected to stand a long railway journey so well as older sheep. During departmental trials in cross-breeding of sheep carried out at Wagga, Cowra, and Bathurst Experiment Farms, New South Wales, from 1913 to 1919 the loss in transit was considered. Each year the lambs were weighed at the farms just prior to despatch and again immediately on arrival at Flemington, receiving no feed or water in the meantime. Putting all farms together the average loss of weight in transit amounted to 7.6 per cent. of the total live weight; that is on a lamb weighing 70 lb. the loss was 5 lb. 5 oz. These figures reveal that a considerable loss occurs and this loss must detract a good deal from the appearance of such a young animal. The distance from market is therefore an item of importance when considering the question of lamb-raising.

When trucking it is a good idea to leave the lambs with their mothers till they arrive at the yards. The lambs then enter the trucks full and contented. In any case some of the ewes should be left with the lambs till they arrive at the trucking yards, otherwise the lambs will be very hard to drive, and may knock themselves about unduly.

To market a lamb as described, good food and plenty of it is essential at all times during the growth of the lamb. Any check due to a shortage of feed means a decrease in the milk supply from the mother, besides a smaller amount of feed collected by the lamb itself from the pastures, and the lamb will never properly recover. The lamb must be grown during that season of the year when the best feed is available, and should be marketed before or as soon as the pastures begin to dry off. The drying off of the pastures will mean a drying of the lambs, and they will lose that sappy nature and bloom which is so desired.

## HORSE VERSUS TRACTOR.

There is a growing opinion among farmers that the subject of horse and tractor is not after all essentially contentious—in other words, that each has its utility on the farm. This was somewhat the point of view expressed by Mr. R. P. Greer, of Emerald Hill, near Gunnedah, N.S.W., in an address before the recent annual conference of the Hunter and Lower North Coast branches of the Agricultural Bureau.

One of the most acute problems facing the farmer, said the speaker, was the cost of production. Under the present disorganised system of marketing, the primary producer was unable to "pass on" any increased cost of production, and until he could be persuaded to take advantage of such beneficent legislation as the recently passed Marketing of Primary Products Act, his only way of combating higher prices for everything that he bought, and lower prices for all that he produced, was to lower as far as possible his own working costs.

Having reached this conclusion, he was ready to fall victim to advertising campaigns designed to show that the easiest way to reduce his working costs was to buy a tractor and get rid of his obsolescent teams.

### Two Questions to Consider.

As far as the cost of cultivation was concerned, it might be shown on paper that the figures for any given cultural operation were somewhat about the same, whether performed by tractor or horses. But how did the thing pan out in actual practice—in hard cash expenditure? His own experience, which was not a lengthy one, was that horse work was much cheaper than tractor operation, even when the teams had been fed on chaff that was saleable on the farm at £6 to £7 per ton and on grain at 5s. per bushel. His records were not complete—he was now keeping accurate note of the various costs with a view to eliminating those that were avoidable—but the figures he had kept (and which he detailed) showed tractor ploughing (based on 400 acres with a ten-furrow implement) worked out at 2s. 7d. per acre, as compared with 1s. 7d. per acre for horse ploughing (based on 100 acres with an eight-horse team).

Owing to the pressure of work no tabulated records were kept of harvesting operations, but the horses were getting only one feed per day—at midday—with one man looking after header and team, while kerosene had to be kept up to the tractor, and two men were required, one driving and one on the header. In spite of this extra expense, he thought that a tractor was particularly useful at harvest time, as it did not tire, and could be kept going throughout the best part of the day, when the horses should be spelling.

### The Horse has still a Place on the Farm.

Accurate and dependable statistics showed that, so far from horses becoming extinct in America, sagacious Canadian and American farmers were importing more and more pedigreed and highly-priced Clydesdales, Percherons, Shire, and other draught horses. But, notwithstanding that horses were indispensable on the farm, power farming had come to stay, for in these days no farmer who put in an extensive area could afford to be without a tractor, since in many cultural and harvesting operations, where time was the essence of the contract, the tractor was invaluable.

This should not induce the farmer to scrap his horse teams, which, for ordinary routine work, were still the cheapest power units on the farm, with the greatest reselling value. Once the tractor left the garage that grisly spectre—depreciation—perched beside the driver. Day by day the tractor's value depreciated, and in a few short years (much fewer than the average working life of the horse) the poor old tractor was on the scrap heap. Not so with the horse teams. Their value should appreciate for many years; old horses might be replaced by their own progeny, and surplus fillies and colts sold advantageously, particularly if a little care had been taken in the selection of a good type of brood mare, and the services of a good sire secured.

And the farmer who was breeding along right lines need not fear the bogey of over-production, for throughout the world there was scarcity of good draught horses. One had but to look at the prices being obtained for suitable draughts at Flemington to realise that horse-breeding was a profitable business, and that it was one that no farmer could afford to neglect.

## Answers to Correspondents.

### Dehorning Cattle.

A.M.T. (Cooran)—

The simplest and most humane way of destroying the horns seems to be to prevent them from developing when the animals are young. This may be done by the use of caustic potash (in the form of sticks), which rapidly destroys the skin and other tissues when kept in contact with them. The method of applying the potash is very simple. The hair is clipped away from the young horn, so that the potash may come in immediate contact with the parts to be treated. The stick of potash is rolled up in a piece of paper, so as to leave one end exposed. The exposed end is moistened slightly and rubbed on the embryo horn for a few seconds, or until the skin begins to smart, care being taken that the whole of the border is included in the treatment. A surface about three-fourths of an inch in diameter will cover the parts in calves a few days old. The best time to apply the potash is between the fifth and tenth days, although it has proved effectual even on the eighteenth day. With older animals a dehorning instrument must be used. Dehorning does not affect the milk production and has the advantage of preventing dairy cows injuring each other by horning when passing in and out of yards.

### BOTANY.

The following reply has been selected from the heavy outgoing mail of the Government Botanist, Mr. C. T. White, F.L.S.:—

### Chaulmoogra Oil—"Topped Lavender."

J.F.B. (Nerada)—

Three closely allied plants are of importance, as the source of "Chaulmoogra Oil":—*Taraktogenos Kuizii* (Burma), *Hydnocarpus Wightiana* (India), and *Hydnocarpus anthelmintica* (Siam). All have been introduced through the efforts of Dr. J. F. Rock—working on behalf of the United States Department of Agriculture—into various tropical countries. Seeds of at least two species have been introduced by the Commonwealth, and if you write to the Director of Tropical Hygiene (Dr. Cilento), Brisbane, or perhaps, the Officer in Charge of Tropical Medicine, Townsville, you would obtain particulars as to the trees now growing in Queensland and the Northern Territory.

The Topped Lavender of Southern Europe, referred to by Mr. Bailey in his booklet on Economic Plants, is *Lavandula stoechas*. This does not do very well in Queensland, except in the cooler parts of the State. If you want to try it, however, you could obtain plants from Southern nurserymen. Messrs. Hazlewood Bros., Epping, New South Wales, quote plants at 1s. 6d. each.

Readers are reminded that a cross in the prescribed square on the first page of this "Journal" is an indication that their Subscription—one shilling—for the current year is now due. The "Journal" is free to farmers and the shilling is merely to cover the cost of postage for twelve months. If your copy is marked with a cross please renew your registration now. Fill in the order form on another page of this issue and mail it immediately, with postage stamps or postal note for one shilling, to the Under Secretary, Department of Agriculture and Stock, Brisbane.

## General Notes.

### Staff Changes and Appointments.

The Police Magistrate, Bowen, has been appointed Government Representative on the Bowen Dingo Board, and Messrs. A. H. W. Cunningham, F. S. Isbell, J. E. Kelly, and G. Massy, junr., have been elected Members of that Board.

Constables C. Elliott and E. A. Sellars, of Tinana and Port Douglas respectively, have been appointed Inspectors of Slaughter-houses.

The appointment of Mr. J. J. McLachlan as Poultry Inspector has been confirmed as from 6th February, 1928.

Mr. H. Keefer, Pittsworth, has been appointed Chairman of the State Wheat Board for twelve months as from 1st September, 1928.

Mr. C. H. Wolff has been appointed Temporary Inspector under the Diseases in Plants Acts for a period of two months as from 1st September, 1928.

### Swine Fever Carried by Starlings.

At the annual conference of the Institute of Inspectors of Stock of New South Wales, in Sydney, Dr. H. R. Seddon gave an outline of the work that is being carried out at the Glenfield Veterinary Research Station, of which he is the Director. He dealt with the progress in the war against various diseases, and made particular reference to swine fever. When he visited areas at Botany, where the disease had broken out, he found that adjoining pens were not affected in sequence, but he was attracted by the large number of starlings in the vicinity, and decided to carry out an experiment at Glenfield. A pen of healthy pigs were placed in proximity to pigs with fever, and the area was enclosed with netting. Six starlings were placed in the area, and they fed in one pen and then in the other. The healthy pigs became affected, showing that the birds carried the virus on their feet.

Swine fever, he explained, was a disease that was difficult to diagnose. Usually the first symptom was that the animal lost its appetite, and this usually occurred three or four days after exposure to infection. This stage was closely followed by a rise in temperature, quite often to 106 degrees. The animal then adopted a characteristic attitude in standing, the head and tail dropping and the back arched. Diarrhoea was a constant symptom, and the pig wasted very rapidly. Coughing was not constant unless the animal was suffering from pneumonia.

### Fallowing as a Vital Factor in Successful Wheatgrowing.

There is no phase in modern farming practice that deserves more attention than the problem of how to maintain an adequate supply of moisture in the soil. Lack of sufficient moisture at the right time does more to reduce the yield of wheat crops in this State than even the lack of available plant-food. This does not refer particularly to periods of drought, such as that experienced during the last wheat-growing season, for the greatest losses from lack of moisture are not from noticeable droughts, but from unnoticed dryness that merely lessens the crops year by year, reducing the average and lowering the standard. So throughout the wheat areas the problem of paramount importance in crop production is how to supply moisture at the right time in adequate quantity, and the solution to the problem is "fallow."

It is unwise to attempt to standardise methods of fallowing, for much is dependent on factors such as climatic conditions and the nature of the soil, but an understanding of the underlying principles of the cultivation methods will enable the farmer better to apply his own judgment as to how and when the various operations should be conducted to suit his own particular conditions.

It is scarcely necessary to mention how important it is that sufficient water should be supplied to enable the wheat crop to live and grow. Water forms from 50 to 90 per cent. of green plants, and a considerable portion of the dry matter of the plant is produced from water and carbonic acid gas obtained from the air. But this is a mere bagatelle compared with the enormous quantity of water which is being constantly taken from the soil by the minute root hairs radiating from the roots, and which passes upward through the stem to the leaves where it is finally evaporated. This process is known as "transpiration," and many experiments have been conducted to determine the amount of water that thus passes through plants in the production of 1 lb. of dry plant substance.

The transpiration is not the same for all plants, nor is it the same under all conditions for the same plant. Both the amount of water evaporated from the

soil and that transpired by the plant leaves increase materially with an increase in the temperature during the growing period, and they are much greater under a clear sky and in districts where the atmosphere is dry—conditions which prevail in most of our wheat areas. When, late on a hot day, a crop is seen to be wilting, the rate of transpiration has exceeded the rate of supply of moisture. In the drier wheat districts it is estimated that approximately 500 lb. of water are required to thus pass through a wheat plant for the production of 1 lb. dry matter.

It would therefore take sixty times 500 lb.—or 30,000 lb.—of water to produce a bushel of wheat. But in order to produce this grain a certain amount of straw—about half the weight of the whole plant—must be produced. Therefore to produce 1 bushel of wheat it takes 60,000 lb. of water, equal to 27 tons.

This may appear a very large figure, but in comparison with the amount of water that falls as rain, it is not so extraordinarily large—1 inch of rain over 1 acre weighs 101 tons. If all this could be stored in the soil and used wholly for plant production it would produce, at the rate of 27 tons of water per bushel, about  $3\frac{1}{2}$  bushels of wheat. Thus 10 inches of moisture represents 37 bushels. It is impossible, however, to bring all the rain that falls into the soil and store it for plant use, and it is not possible to treat soil so that all the stored moisture may be used for plant production; for instance, some must of necessity be evaporated directly from the soil. Experiments have shown, however, that it is feasible by cultivation methods to conserve half the rainfall, so that the yields mentioned are possible every other year.—“Agricultural and Pastoral Notes,” New South Wales Department of Agriculture.

### Points in Dairy Practice.

Dairy cows should be fed and milked with persistent regularity; avoid changing milkers; avoid any abnormal changes, and preserve quietude in all operations.

Less feed is required in winter if artificial warmth is provided. Shelter or rug cows in winter.

Stimulate the digestive functions of cows by giving them a variety of foods, and always give access to salt.

Occasional changes of diet are useful, but should be effected gradually.

Mixtures of concentrated feeds are better than one, and are more economical.

Reject all musty or mouldy food.

Salt licks, good water, clean, airy, well-lighted, and well-drained sheds are desirable adjuncts to good food.

### Obituary.

The news of the death of Mr. W. H. Brown, Editor of the “Agricultural Gazette” of New South Wales, which occurred in Sydney on 10th August, was received with great regret.

Mr. Brown was appointed to the New South Wales Department of Agriculture in 1912 as Editor of “Agricultural and Pastoral Notes,” and the success of that news-sheet as a means of keeping the country Press in touch with Departmental recommendations and methods was entirely due to his efforts. In 1914 he was appointed as Assistant Editor of Publications in his State, and five years later was promoted to the position of Editor, which he occupied until the time of his death.

His extensive experience in journalistic work on the agricultural columns of newspapers, both in New South Wales and in New Zealand, enabled him to accumulate a vast store of knowledge on matters agricultural, and this, coupled with the fact that he was widely read and possessed of great capacity, resulted in the standard of the numerous Departmental publications being raised to a high level, which has been greatly appreciated by the farming community throughout New South Wales and neighbouring States.

Apart altogether from his work, Mr. Brown's kindly and courteous nature endeared him to all with whom he came in contact, and he will always be affectionately remembered, not only by his fellow officers, but by fellow inky wayfarers who worked with him for the general benefit of Australian farmers.

# The Home and the Garden.

## FLOWERING SHRUBS.

By Mr. E. W. BICK, Director of the Botanic Gardens.

From an address delivered at the May meeting of the Queensland Horticultural Society.

A few years ago many varieties of Abutilons were grown, but now comparatively few are to be seen. In America Abutilons are known as the Chinese Bell Flower; here the vernacular is Chinese lantern. The best known are Boule de Nègre (white), Golden Fleece (yellow), Thompsoni, both in single and double-flower forms, with variegated yellow and white foliage. Souv. de Bonn and Sawitzii are two kinds with silvery variegations. Any of the above are well worth growing. Abutilons are easily propagated from cuttings. They belong to natural order Malvaceæ, or Mallow family.

Hibiscus, in the same natural order, are divided into several groups, one of the most prominent being *Rosa-sinensis*, to which class most of the hibiscus seen in our gardens belong. The hibiscus syriacus types are deciduous, and will stand a much colder winter than ours. They are largely grown in Melbourne and Adelaide, as they thrive better than the *rosa-sinensis* under the conditions there.

### Hibiscus.

There are many different kinds of *Hibiscus rosa-sinensis*; the number is said to be several hundreds. A dozen of the best are Peach Blow (pink), Conqueror and Tango Queen (buff yellow or apricot), Island Empress and Island Queen (double and single deep rose), Rose Morn (old rose), Gloria (Chinese orange), George Harwood (single pink), Fulgida (scarlet, with black centre), Double Red, General Courtgeis (large, single red), and Schizopetalus, the so-called Japanese fuchsia or Tassel Hibiscus. The latter seeds freely, and is a useful kind for cross-fertilisation purposes. Hibiscus stand pruning well, and is useful for hedges. When utilised for this purpose use all one kind, as there are many variations in growth amongst the different kinds. Hibiscus strike readily from cuttings.

### Azaleas.

Azaleas, the beautiful spring flowering plants, deserve more attention and should be more often seen. The type best suited for local growth is *Azalea indica*, with single flowers; the semi-double and double kinds are largely grown in the South.

### Rhododendrons.

Rhododendrons also are grown in the South, but even there, apparently, they thrive best in fairly high altitudes. It is of interest to note that there is a native rhododendron found in Queensland, near the summit of Bellenden Ker, also at Mount Sturgeon. Azaleas are slow in growth, and are obtained best from layers.

### Other Shrubs.

*Galphimia glauca*, a yellow, free-flowering shrub from Mexico, was growing in both the Botanic Gardens and Bowen Park in 1885, but is not often found in private gardens. It is well worth growing, as it flowers continually throughout the summer months.

*Murraya exotica* and *Murraya paniculata* are both dense-growing shrubs, with English box-like foliage. Both have white, strongly-scented flowers. Those of *exotica* are borne in denser terminal clusters than those of *paniculata*, and the foliage of the latter is rather coarser. *Murraya* is sometimes called Mock Orange, also Indian satinwood. It should not be planted near dwellings, as the heavy scent is apt to be overpowering.

*Ochna atro-purpurea* is a shrub from Natal well worth a place in gardens. It has yellow flowers. After the petals fall off, the calyx develops from green to a bright red tint, and from its centre shining black carpels containing the seeds are produced that provide quite an ornamental appearance.

The *Crotalaria* or Rattle pods, a number of which are weeds, provide two species of interest in *Crotalaria Cunninghamii* and *C. laburnifolia*, commonly called bird flowers from their resemblance to birds. Possibly they are more curious than beautiful; they are propagated from seed.

In the same order *Sesbania tripetta* occurs. It is known as the Argentine Glory Pea, and although somewhat straggly in growth, has a fine effect when carry-

ing its large clusters of orange red, pea-shaped flowers. Many persons have attempted to grow this plant in Brisbane, but only a few have been really successful. It requires a well-drained light soil.

*Cæsalpinia Gilliesii*, the Bird of Paradise flower, is a free-flowering and attractive shrub. The red flowering form *Cæsalpinia pulcherrima* is well worth a place in a large garden. Its beautiful scarlet flowers with long stamens and yellow markings are borne throughout the summer months on erect stems, at the base of which seed pods form whilst the flowers are still forming at top.

Cassias (although many are trees) provide some free-flowering shrubs. *Cassia corymbosa* flowers abundantly at this time of year, the whole plant being covered with a mass of golden-yellow blooms. *Cassia didymobotrya*, said to have been brought from Egypt by members of the A.I.F., has particularly fine foliage, is robust in growth, and remains in flower many months. *Cassia artemesioides*, Desert Bush, is also free-flowering. In spring, although somewhat subject to borer pests, this native shrub is well worth a place.

*Callianara pulcherrima* is a strong-growing, red-flowering shrub from Mexico. The long stamens give it quite a bottle brush and attractive appearance. In *N. O. Rosaceæ* we have the Spireas double and single May, *S. Reevesiana* and *S. bella*, also *Kerria japonica*, a small-growing shrub with clusters of yellow flowers, another old favourite now almost out of cultivation.

*Photinia serrulata*, the Chinese hawthorn, is a close relative of the loquat. It bears large flat heads of small flowers that are very attractive to bees. The well-known Indian hawthorn, *Raphiolepis indica*, also occurs in this order. *R. ovata* is a very dwarf, slow-growing shrub compared with its robust relative *indica*, and on account of its large size is only fit for big shrubberies. *Raphiolepis intermedia* is quite the best of the three, the flowers being finer than *indica*, and its growth an improvement on that of *ovata*.

Hydrangeas are worth more attention than they are receiving. They delight in a well-watered, preferably shady situation. There are a number of good new kinds. Most of those grown locally are *H. hortensis* and its varieties. We have one that was sent as a red-flowering variety, but when it flowered it was a bright rose pink, certainly not red.

The *Deutzias* are small in growth, with pretty lily of the valley shaped spikes of flowers. *D. scabra* and *D. crenata* do well about Brisbane. *Philadelphus coronarius*, Mock orange, and its variety, *grandiflorus*, although coming from quite a cold district of the Himalayas and Thibet, also do well here. Its fairly large white flowers with creamy stamens are borne in clusters or racemes, and, as its vernacular implies, are strongly scented.

*Escallonia montevidiensis* comes, as its name suggests, from Brazil. It is a large shrub and bears big clusters of small white flowers. This plant requires plenty of room.

The *Pleroma*, or *Lasiandra*, also called *Tibouchina*, is another South American family, chiefly from Brazil. *Lasiandra Fontainesi* and *L. Macrantha* are the two best known here. Both have large, deep rich violet-blue flowers. *Macrantha* has the largest flowers and foliage and a dwarf habit of growth, whilst *Fontainesi* has smaller flowers and leaves and is taller of growth and somewhat straggly in habit.

*Heeria rosea*, or *Heterocentrum roseum*, is another small-flowering plant which has also apparently gone out of cultivation. It belongs to Mexico, and the flowers are numerous and small, of a bright rose colour, borne on terminal panicles.

*Cupheas platycentra* and *jourellensis* have small, tubular flowers borne in clusters; *C. platycentra* has bright red flowers tipped with white, whilst *jourellensis* has larger flowers of a dull red tint.

The *Lagerstræmias* are well known to all. *L. indica* is the common red, and its numerous garden hybrids in pink, white, mauve, &c., are those usually seen in cultivation. The most striking of all is *L. Matthewsii*, with its large terminal clusters of crinkled lilac-purple flowers. It is interesting to note that there is a native *Lagerstræmia*, *L. Archeriana*, named by the late F. M. Bailey after Mr. Archer, a member of the well-known Central Queensland family. The plant was found on the Palmer River, but there appears to be no record of its having been cultivated.

Although not often seen about Brisbane, the *Laurestinus*, *Fiburnum tinus*, is well worth growing, particularly in cold districts. *Diervilla rosea*, a Chinese shrub, is also worth attention. It bears pale rosy coloured somewhat tubular flowers in clusters on stem.

The *N. O. Rubiaceæ* contains quite a lot of flowering shrubs, including *Bouvardia*, *Begonia*, *Gardenia*, *Ixora*, *Pavetta*, *Hamelia*, and *Mussaenda*. *Bouvardias* are well known, but not cultivated much in recent years. They are not long-lived plants, and

provision should be made for their replacement. *Rondeletia speciosa* is a slow-growing shrub with bright orange-red flowers borne in clusters, not unlike those of lantana. It is suitable for small gardens. *R. versicolour* or *R. amara* is a much stronger shrub, with beautiful soft pale rose-pink clusters of flowers. It does remarkably well here.

*Hamelia patens* is a useful shrub well worth growing. A few years ago there was a fine plant of it on the Northgate station platform. *Ixoras* are other plants that wax scale often completely spoils. The pest may be destroyed by dusting frequently with lime. The flowers of *Ixoras* are not unlike those of bouvardias, but on a much larger scale. *H. coccinea* and *H. macrothyrsa* are the two most popular kinds. *Coccinea* has orange red flowers borne in large dense clusters; *macrothyrsa* has smaller flowers of a duller colour, and not set so closely together.

There is also a native *Ixora Timorensis*, that occurs both in Timor and in Queensland. It bears white flowers in clusters, and is quite a large shrub. *Pavetta natalensis* is one of our best garden flowering shrubs. It bears profusely clusters of white flowers, and is like a white *Ixora*. The foliage is dark green and shining, making a good background for the flowers, and insect pests never trouble it. As a garden shrub it should be more often seen.

The lumbagos are useful shrubs in blue, white, and rose coloured flowers. Probably *rosea* is the most striking; it is rather slow in growth, but flowers freely. It is very suitable for a small garden.

*Nyctanthes arbor-tristis*, or Tree of Sadness, is an interesting shrub; it has numerous white wheel-like flowers with a yellow centre borne on leafy terminal panicles. The plant takes its name from *Nyctos* night *anthos* flowers, in allusion to the flowers opening at dusk and falling off shortly after sunrise the next morning. It is strongly scented during the night.

Of the *Buddleias*, *B. Veitchiana* is a useful shrub with beautiful long racemes of lilac-coloured flowers; it is also strongly scented. This plant should be pruned after each flowering. *Clostrum nocturnum* is night flowering, and although the flowers are rather insignificant the perfume is very powerful, and may be noticed a considerable distance from the plant. *Cestrum elegans* and *C. Newelli* (formerly called *Habrothamnus*) are two very useful flowering shrubs for small gardens. The flowers are tubular, borne in terminal drooping clusters, and of a dark rose colour in *elegans*, those of *Newelli* being of a much lighter tint.

*Brumsfelsia*, or *Francisca*, do best in a sheltered situation. The best known are *B. uniflora*, with blue and white flowers, and *Americana*, the flowers of which open white and develop to a deep cream colour. *B. eximica* has much larger flowers than *uniflora*, and of a deeper shade of blue in colour. All are strongly perfumed.

The *Allamandas* are chiefly climbers, but *nerifolia* is a shrub with small yellow flowers. *A. violacea* is also usually grown as a shrub. The latter is very distinct from all other *Allamandas*, as the flowers, instead of being yellow, are of a rich reddish-purple, shading to yellowish-white.

Some recently introduced *Neriums* or oleanders are well worth growing in large gardens. They comprise new shades of reds, pinks, and salmons.

Of the *Tecomas*, mention may be made of *T. stans* and *Smithii*. *T. stans* is the large shrub bearing big clusters of yellow flowers. *Smithii* is of the same type with smaller and deeper coloured flowers. Many people get mixed regarding *tecomas* and *bignonias*. The chief difference between them is that the *bignonias* have tendrils to cling by, whilst the *tecomas* have not.

*Graptophyllum Earlii*, sometimes called the native fuchsia, is a compact growing shrub, bearing deep red flowers. This plant is not often met with in cultivation. It is worthy of more attention.

*Clerodendron fallax* and *C. nutens* are favourite free-flowering plants. *C. fallax* is a native of Java. It has large soft leaves, bears clusters of rich scarlet flowers, and delights in a shady, moist situation. *C. nutens* comes from India. It bears long drooping racemes of white flowers that are very effective. Both *Clerodendrons* mentioned are very suitable for small gardens.

*Holmskioldia sanguinea*, an Indian-red flowering robust shrub, is useful in that it flowers during winter, when flowers are scarce. This leads us to *Poinsettia pulcherrima*, or *Euphorbia pulcherrima*. There are four forms of the poinsettia—the type with very large drooping bracts of a vermilion red; another of rather upright growth with smaller and lighter coloured bracts; a double form called var. *plenisima*; and the fourth with creamy-white or pale-yellow bracts. All are effective in the garden. The yellow bracts remind me of *M. Mussenda frondosa*, a leafy shrub from India that bears tiny orange-red flowers surrounded by large bracts, similar to those of the white poinsettia. Unlike the poinsettia, which often sheds most of its leaves when the bracts are developed, the *Mussenda* produces its flowers and bracts all over a leafy dense growing plant, with excellent effect.

### BOUGAINVILLEA.

Anyone visiting the beautiful garden of Mr. Thomas, at Indooroopilly, again this year, will be impressed with the many possibilities of design and effect that can be made with this very hardy and showy climber. The appreciation of the bougainvillea is shown by the hundreds of persons who go to see it in bloom. It is a hardy plant, and loves sunshine, and there is no reason why it should not be more widely grown. A little time and patience will amply repay anyone who contemplates its culture. Cuttings strike readily as soon as the blooming period is over. They should be about 12 in. long. Select last season's growth, and plant in sandy soil in a shady place.

Put the cuttings about 6 in. deep in the soil, and press down firmly. Keep the ground moist, not soaking wet. If you require a more immediate result, obtain plants from the florists in pots. There are about seven different colours to select from. When the plants have grown to a height of 2 ft. then select your design and prune accordingly. To train the plant make a skeleton design of wire, and then trim the plant by removing all shoots that may be growing in a direction that is not required. About May or June pruning must be stopped, as all the new shoots then appearing will be flowering shoots. As soon as the blooming period is over commence pruning again to still improve your design.

There are many methods of growing bogainvillea, and one that finds favour with many is that of planting it around an old tree that is not wanted, and ringbarking the tree when the bougainvillea is firmly established. It will then hang down from the branches of the tree and form a beautiful garland of bloom. It is an evergreen and never appears unsightly.

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### DRACÆNAS.

Dracænas are hardy plants with very richly coloured and variegated foliage. They are closely allied to the genus cordyline, with which they are often confused. The difference between the two is chiefly in the character of the fruits, there being generally one ovule in the dracæna and many ovules in the cordylines. Dracænas are among our most beautiful foliage plants. Propagation is generally by cuttings, which root readily at any time of the year. The old stem of the plant, cut into short lengths and planted in a compost, invariably roots, and throws up shoots which may be potted up. The root suckers which are often found upon old plants are also useful for increasing stock. All that is necessary is to cut them off and pot them.

The best soil for potting the young stock is made of equal parts of loam and leaf mould, with sufficient sand to keep the soil porous. Dracænas do not require large pots, but they must be firmly potted and given plenty of water.

Mealy bugs and thrips are the chief enemies. The large leaves permit of the free use of the sponge. Dracænas are fine indoor plants, but they must not be kept inside for more than a week or so at a time, and they must be kept out of draughts.

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### WELFARE OF BABIES.

#### Their Care in the Hot Weather.

The following note has been issued by the Queensland Baby Clinics:—

As the weather grows warmer babies need less clothing. In some parts of Queensland the weather is changeable at this season, and the baby's clothing should be regulated by the temperature, not by the calendar. Over-clothing causes sweating, and may lead to irritation and inflammation of the skin. Waterproof coverings over wet napkins are very likely to do this, and they should not be used. When it becomes really hot, the baby will be happier if he wears little or nothing besides a napkin and singlet, with all his limbs free, but protected by mosquito netting against flies and mosquitoes. He enjoys kicking his legs and waving his arms freely, and this is one of the advantages Queensland babies have.

In hot weather babies need rather less food, but more water. Let them have water to drink between their feeds. A baby may be thirsty without being hungry, and if you try to satisfy his thirst with milk, which is a food, you may upset him. Be careful in increasing his diet at this season. If he is being fed on cow's milk, this should be clean and fresh. As soon as possible after delivery put the milk in a small saucepan, which should be used for this purpose only, and bring it to the boiling point. Unless the milk has been properly pasteurised by a trustworthy process, this should always be done. Freshly-boiled or pasteurised milk will keep

quite fresh in an ice box for twenty-four hours, but without ice it cannot be expected to keep fresh for more than twelve hours. An ice box can be made of a kerosene tin placed in a box, with 3 or 4 inches of dry sawdust all round and covered by a lid.

### **Diarrhoea.**

Babies who are being artificially fed very easily get diarrhoea in hot weather. It may be caused by over-feeding, by unsuitable food, or by milk which is stale or dirty. If an artificially-fed baby begins to have loose motions, all his food and all his milk should be stopped. He should be given one dose of castor oil to clear out any undigested food, and after that he should have nothing but thin barley water, slightly sweetened, for twenty-four hours. If then he is not quite well you should get medical advice or take him to the nearest baby clinic.

### **Gastro-Enteritis or Dysentery.**

Gastro-enteritis or dysentery is a serious disease which may begin gradually with loose motions, but sometimes comes on suddenly with fever, and much weakness and irritability. The motions may be simply loose at first, but after a time they are seen to contain slime tinged with blood, may be very frequent, and attended by much straining. Next month there will be many cases of this disease in Queensland, and some of these babies will die, for this has been so every year. If all our mothers understood how the disease is caused, and why it spreads from house to house, there would be much less dysentery and very few deaths from this disease among our babies.

Dysentery is not caused by the heat. Usually the worst of the epidemic is over before the hottest weather begins, though sometimes it continues right through the summer. Dysentery is not caused by feeding babies on cow's milk, for all diseased germs in the milk are killed by boiling or pasteurising. But it is much more common among bottle-fed babies, whatever food they are getting, than among babies on the breast. The disease is caused by dysentery bacilli, and these disease germs are conveyed by flies from closet pans or other filth to the babies' food. Not only must the food be most carefully protected from flies, but so must the bottles and teats after they have been scalded. Even breast-fed babies are not safe if they have dummies pinned on to their frocks to invite the disease-bearing flies to settle on them.

Protect your baby against this enfeebling, painful, dangerous, and often fatal disease by natural feeding, by avoiding the dangerous dummy, and by carefully protecting its artificial food from infection by flies.

### **Barley Water.**

Take one tablespoonful of pearl barley, wash it carefully, add to it one pint of water, and simmer for one hour. Then make up to one pint from the kettle and strain carefully. Prepare fresh twice daily.

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## **Farm Notes for November.**

**FIELD.**—Farmers are commencing to realise that quick-maturing wheats which possess a degree of rust resistance are more dependable than the slow-growing and often rust-susceptible kinds, which are gradually giving place to these and mid-season varieties.

Growers are advised to make every preparation to work up the surface of the ground immediately after the removal of their crops, so that the soil may be put into good condition to receive any rain which falls, the conservation of which is the best guarantee for the success of the next succeeding crop. Such initial preparation also encourages the early growth of all foreign and weed seeds, and permits of their eradication by the implements used to produce the desired soil mulch. In such manner paddocks are kept clean and the purity of crops is maintained. The careful preparation of areas intended for maize-planting cannot be too strongly impressed upon growers. Deep and thorough ploughing, followed by cross-ploughing and subsequent cultivation of the soil, must precede sowing if success would be attained; and all efforts must be concentrated to obtain a good surface mulch. Failure to follow up the subsequent sowings by harrowing prior to the appearance of the young plant conduces to weed growths and very often entails, by neglect of this operation, subsequent hand-hoeing between the plants in the drills. Harrowing should be discontinued before the plant breaks through the surface, otherwise damage.

will accrue to the tender shoots of the young plants. When the young maize plant has hardened up it may, with advantage, be lightly harrowed in the direction of the drills, but such practice must be discontinued once the plant has attained a height of 6 inches. Close cultivation by inter-row cultivation implements is necessary after every shower to conserve moisture and to prevent weed growth, care being taken to ensure each cultivation being shallower than the preceding one, and so prevent damage to the root system of the plant, which is extensive. Inter-row cultivation should cease with the advent of the cob on the plant; and, if proper attention has been given to the crop, it should, at this period, be unnecessary. Where crops are planted on the check-row principle, inter-row cultivation is facilitated, and more even crops result.

The French millets (red and white), owing to their rapid maturing qualities, form excellent intermediate or supplementary crops, and are suitable for present sowing. Their value for fodder and seed purposes is worthy of more general recognition at the hands of the average farmer.

Past dry periods have impressed upon us the necessity of providing during good seasons against the return of less favourable ones, and in this connection the cultivation of quick-growth fodder plants appeals to us. Many varieties of useful classes of fodder can be cultivated over a large portion of this State; chief of which, perhaps, are the sorghum family for grain and fodder purposes. Of the latter, Sudan grass has much to commend it, and is fast becoming one of the most favoured by stockowners. Grain sorghums, of which Peterita, Red Kaffir, and the various Milos are examples, should occupy a more prominent position for purposes of horse and pig feeding, and are particularly suited to those localities which are unsuitable for maize production. Some varieties of sorghum have strong frost-resisting qualities, and lend themselves to those localities where provision for some form of succulent fodder is necessary during the winter months.

## Orchard Notes for November.

### THE COASTAL DISTRICTS.

November is somewhat of a slack month for fruit in the coastal districts, as the citrus crop, excepting a few Valencia Late oranges, off-season lemons, and a few limes, is over. Pineapples are also scarce, as the late spring crop is finished, and there are only comparatively few off-season fruits ripening. The main summer crop of fruit in the principal producing districts is only in the flowering stage, though that in the more tropical parts is ready for marketing. It is also a slack month for bananas, as the summer fruit is not yet fully developed, and the bunches that make their appearance are usually poor. They have been slow in developing on account of the comparatively cool weather of winter and early spring, when the suckers were more or less at a standstill. Young suckers should, however, be making vigorous growth now, and the plantation will require constant attention to prevent the stools being overcrowded with too many suckers. Keep the land well worked and free from weeds of all kinds, as good growth now means good bunches in the autumn and early winter. Where there is a danger of the soil washing badly with heavy rain, rows of Mauritius, velvet, or other suitable beans should be planted at right angles to the fall of the land, as the growth they make will tend to hold the soil and thus save any from being washed away. When planting beans of any kind, either to prevent washing or for green manuring, don't forget to manure them, as thereby you will get a much greater yield, and as none of the manure is removed from the soil, as the crop is allowed to lie and rot on the ground, it is all made use of eventually by the permanent crop.

A good all-round manure for a bean crop is a mixture of 1 cwt. of sulphate of potash and 4 cwt. of basic superphosphate or finely-ground phosphatic rock to the acre, and, if the soil is deficient in lime, a dressing of not less than half a ton to the acre will be found very beneficial, as all leguminous plants require lime to yield their maximum return both of haulm and pulse. The pineapple plantations require to be kept in a state of thorough tilth, and no weeds must on any account be allowed to grow. If blady grass makes its appearance it must be stamped out, as once it gets established in the rows it is only a short time before it takes control, and the plantation is ruined, so that it can only be brought back into profit by taking out the pines, killing the blady grass, and, after thoroughly and deeply working the land, manuring it and replanting.

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The planting of pineapples and bananas can be continued throughout the month, taking care to see that the land is properly prepared and that the advice given in previous monthly notes is followed. Young papaw plants that have been raised in the seed bed can be set out now, as also can young passion fruit. Citrus orchards require to be well looked after; the ground must be kept in a state of thorough tilth, and if the trees show the slightest sign of distress, owing to lack of moisture in the soil, they must be given a thorough irrigation if water is available for this purpose. The trees should be carefully examined from time to time so as to note when young scale insects of any kind are hatching out, and when this is noted they should be sprayed with a weak emulsion of a miscible oil consisting of one part of oil in forty parts of emulsion, as this is quite strong enough to kill any young scales before they develop their protective covering. As stated in these notes previously, no oil sprays should be used when the trees are suffering from lack of moisture, as they are then likely to do more damage than good to citrus trees. If scale insects are very bad, and it is important that the trees are sprayed, a weak lime-sulphur spray, or even a soap and tobacco or weak resin wash, will kill the young scales as they hatch out. In the earlier districts a keen lookout must be kept for the first appearance of the mites, which are the direct cause of the darkening of the skin of the fruit known as "Maori." The first indication of the trouble is that when the sun is shining on the young fruit it appears to be covered with a grey dust, and if the fruit is examined with a good lens it will be seen to be covered with large numbers of small yellowish slug-like insects which are living on the skin. Spraying with sodium or potassium sulphide washes, as recommended by the Department, or with a weak solution of lime-sulphur, will destroy these insects and prevent the fruit from turning black. Borers of all kinds should be looked for and destroyed wherever found. Water sprouts, if not already removed, should be cut away. Vines will require careful attention, and the vineyard should be kept in a state of thorough cultivation. Spraying for downy mildew and black spot should be continued, if necessary, as well as sulphuring to prevent oidium.

Fruit fly must be systematically fought whenever seen, and special care must be taken to gather and destroy any early ripening peaches or other fruit that may be infested. If this is done systematically by all growers, as provided by the Diseases in Plants Act, there will be many less flies to attack the later crops of mangoes and other fruits.

Leaf-eating insects of all kinds should be systematically fought wherever seen, by spraying with arsenate of lead, and potatoes and tomatoes should be sprayed with a combined spray consisting of Bordeaux or Burgundy mixture and arsenate of lead, so that diseases such as early blight and Irish blight may be prevented and leaf-eating insects, which frequently cause very heavy losses to these crops, be destroyed.

## THE GRANITE BELT, SOUTHERN AND CENTRAL TABLELANDS.

Keep the orchards and vineyards in a thorough state of cultivation, so as to keep down all weed growth and conserve moisture in the soil. This is important, as, if a long spell of dry weather sets in, the crop of summer fruit will suffer severely from the lack of moisture. Citrus trees should be irrigated where necessary, and the land kept in a state of perfect tilth. Spraying for codlin moth should be continued, and all pip fruit trees must be bandaged at the beginning of the month; further, the bandages must be examined at frequent intervals and all larvæ contained in them destroyed. The neglect to spray thoroughly and to attend to the bandages properly is responsible for the increase in this serious pest in the Granite Belt, and growers are warned that they must pay more attention to the destruction of this pest if they wish to grow pip fruit profitably. Fruit fly may make its appearance in the cherry crop; if so, every effort should be made to stamp out the infestation at once, as, unless this is done, and if the fly is allowed to breed unchecked, the later ripening crops of plums, peaches, apples, pears, apricots, and Japanese plums are bound to become more or less badly infested. Combined action must be taken to combat this, the most serious pest of the Granite Belt, and growers must realise that, unless they take this action and see that careless growers do not breed the fly wholesale, they will never keep it in check, and it will always be a very heavy tax on their industry. Rutherglen bug is another serious pest in this district, and is propagated by the million by careless orchardists. The best remedy for this pest is to keep the orchard clean and free from weeds. Brown rot in fruit should be watched for carefully, and, on its first appearance in a district, all ripening fruit should be sprayed with the sodium sulphide wash.

All kinds of leaf-eating insects should be kept in check by spraying with arsenate of lead, and all grape vines, potatoes, and tomatoes should be kept sprayed with Bordeaux or Burgundy mixture, the former for black spot and downy mildew, and the latter for early and late (Irish) blight.

**ASTRONOMICAL DATA FOR QUEENSLAND.**

TIMES COMPUTED BY D. EGLINTON, F.R.A.S., AND A. C. EGLINTON.

**TIMES OF SUNRISE, SUNSET, AND MOONRISE.**

AT WARWICK.

MOONRISE.

Date.	October, 1928.		November, 1928.		Oct., 1928.	Nov., 1928.
	Rises.	Sets.	Rises.	Sets.	Rises.	Rises.
1	5.34	5.50	5.3	6.9	p.m. 7.42	p.m. 10.9
2	5.33	5.51	5.2	6.10	7.42	11.12
3	5.32	5.52	5.1	6.11	8.49	a.m. ...
4	5.31	5.52	5.0	6.11	9.58	12.10
5	5.29	5.53	5.0	6.12	11.5 a.m.	1.1
6	5.28	5.53	4.59	6.13	12.10	1.42
7	5.27	5.54	4.58	6.13	1.11	2.17
8	5.25	5.54	4.57	6.14	2.6	2.49
9	5.24	5.55	4.57	6.15	2.50	3.19
10	5.23	5.55	4.56	6.15	3.30	3.48
11	5.22	5.55	4.56	6.16	4.4	4.19
12	5.22	5.56	4.55	6.17	4.36	4.49
13	5.21	5.56	4.55	6.18	5.6	5.21
14	5.20	5.57	4.54	6.18	5.36	5.58
15	5.19	5.57	4.54	6.19	6.7	6.40
16	5.18	5.58	4.53	6.20	6.37	7.27
17	5.17	5.59	4.53	6.21	7.11	8.17
18	5.16	5.59	4.53	6.21	7.50	9.10
19	5.14	6.0	4.52	6.22	8.35	10.6
20	5.13	6.1	4.52	6.23	9.23	11.4 p.m.
21	5.12	6.1	4.51	6.24	10.14	12.3
22	5.11	6.2	4.51	6.25	11.5 p.m.	1.3
23	5.10	6.2	4.51	6.26	12.5	2.4
24	5.9	6.3	4.51	6.27	1.6	3.6
25	5.8	6.4	4.51	6.28	2.8	4.12
26	5.7	6.4	4.50	6.29	3.11	5.20
27	5.7	6.5	4.50	6.29	4.13	6.33
28	5.6	6.6	4.50	6.30	5.19	7.37
29	5.5	6.6	4.50	6.31	6.28	8.54
30	5.4	6.7	4.50	6.31	7.39	9.58
31	5.4	6.8	...	...	8.51	...

**Phases of the Moon, Occultations, &c.**

The times stated are for Queensland, New South Wales, Victoria, and Tasmania.

6 Oct.	☾ Last Quarter	3 6 p.m.
14 "	● New Moon	1 56 a.m.
22 "	☾ First Quarter	7 6 a.m.
29 "	☾ Full Moon	8 4 a.m.

Perigee, 2nd October, at 8 0 a.m.

Apogee, 18th October, at 6 6 a.m.

Perigee, 30th October, at 11 54 a.m.

The occultation of Kappa Tauri, a somewhat larger star will be observable on the 3rd throughout Queensland at various times between 2.35 and 2.50 a.m., depending upon the position of the observer.

Another small star in Taurus will be occulted at Gympie and Maryborough very shortly after the one previously mentioned, but as much as 20 minutes later at some places north and south of those given.

The conjunction of Mars with the Moon on the 5th at 7 p.m. will be unobservable, as both will be below the western horizon. The conjunction of Mercury and the new Moon on the 15th will also be unobservable.

The conjunction of Venus with the Moon on the 16th at 2 p.m. will occur too much in the direction of the Sun to be noticeable.

It will be interesting to observe the apparent proximity of the Moon and Saturn as they draw near the western horizon after sunset on the 18th.

Saturn will be one of the finest objects for observation in a telescope this month, the northern side of the rings being remarkably well displayed.

The occultation of Si ma Sagittarii, magnitude 2.1, will take place on the evening of the 20th about 9.25 p.m. in Southern Queensland, but half an hour earlier in the far north.

Epsilon Capricorni will be occulted on the 23rd about 10.30 p.m. in Southern Queensland, but as much as half an hour earlier in the north.

Mercury will pass from east to west of the Sun on the 24th, but instead of a transit across the Sun's face it will pass on the south side of the Sun, apparently at a distance for the Moon to intervene.

The occultation of Psi Aquarii will occur on the 25th about a quarter to 10 in Southern Queensland, but not till a quarter past 10 in the far north. A small star in Taurus will be occulted on the 31st soon after half-past 3 a.m. at Brisbane, Toowoomba, and Warwick.

The Southern Cross will approach the south-western horizon early in the evening, and will soon become invisible especially in the latter part of the month.

5 Nov.	☾ Last Quarter	12 6 a.m.
12 "	● New Moon	7 35 p.m.
20 "	☾ First Quarter	11 35 p.m.
27 "	☾ Full Moon	7 5 p.m.

Apogee, 14th November, at 6.6 p.m.

Perigee, 27th November, at 11.30 p.m.

The occultation of Nu Virginis by the Moon will take place about two and a-half hours before sunrise at places as far south as Rockhampton on the morning of the 6th, but somewhat later at Mackay, Townsville, and Cairns.

For places west of Warwick and nearly in the same latitude, 28 degrees 12 minutes S., add 4 minutes for each degree of longitude. For example, at Inglewood, add 4 minutes to the times given above for Warwick; at Goondiwindi, add 8 minutes; at St. George, 14 minutes; at Cunnamulla, 25 minutes; at Thargomindah, 33 minutes; and at Oontoo, 43 minutes.

The moonlight nights for each month can best be ascertained by noticing the dates when the moon will be in the first quarter and when full. In the latter case the moon will rise somewhat about the time the sun sets, and the moonlight then extends all through the night; when at the first quarter the moon rises somewhere about six hours before the sun sets, and it is moonlight only till about midnight. After full moon it will be later each evening before it rises, and when in the last quarter it will not generally rise till after midnight.

It must be remembered that the times referred to are only roughly approximate, as the relative positions of the sun and moon vary considerably.

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# QUEENSLAND AGRICULTURAL JOURNAL

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PART 5

## Event and Comment.

### The Agricultural Situation in Queensland.

IN the course of a general survey of the agricultural position in Queensland in the Annual Report of the Department of Agriculture and Stock, the Under Secretary, Mr. E. Graham, says that the Queensland farmer now possesses much greater bargaining power than he had formerly through centralised selling, which has followed the establishment of commodity boards and the consolidation of existing co-operative associations on a commodity basis.

While the fundamentals of efficient production are not being neglected, the importance of finding solutions for economic and social problems affecting the man on the land is recognised, not only by leaders in the industry but by others who are more or less concerned directly in the improvement of agriculture in this country. It is plain that constructive effort must be directed towards the attainment of a true balance in the industry, and to accomplish this it must cover the whole range of capitalisation, production, marketing, distribution, and consumption. The Department is giving increased attention to economic investigation, and some results of this work have been circulated widely, to the general advantage of those engaged in primary enterprise.

A fuller understanding or appreciation of country life, its special problems and relative matters, is evident among farmers, and they are, through their organisations, developing a definite sense of direction towards agricultural betterment.

Both on the production and marketing sides there is a greater tendency to get right down to business, to work along proven lines and make full use of present means, improving them where possible, and extending methods that have stood practical test.

### **The Farmer Must make his Own Standards.**

THE variation in production on different holdings and in different districts suggests the opportunities that are in the hands of the farmers themselves of modernising methods of cultivation and improving the quality of crops, thus lessening costs. Individual action is quite as important as co-operative action in the establishment of high standards of production, and in the regulation of output, whether in respect of quality or volume, to comply with market demands. However efficient public or community services, commodity boards, or co-operative enterprises may be, the farmer's business success, if climatic and other hazards beyond control are eliminated, is in his own hands. He must primarily make his own standards of living for himself. Inefficiency in farm practice, or lessened productivity, must react inevitably to his disadvantage against any measure designed to extend the radius of his opportunity.

With the return of good seasons the cattle industry is moving once more towards prosperity.

### **Dairying in Queensland.**

DAIRYING is in a relatively favourable position, and dairy farmers are realising, in the main, that the production of high quality milk and increased quantity of butter-fat from fewer cows at less cost is the quickest way of increasing the net farm income. Our average yearly output of butter-fat per cow is far too low, and it is apparent that many dairy farmers are not making any substantial profit on their business.

These facts were confirmed by a Departmental investigation into the economies of the industry, which was continued in the course of the year. Some of the results have been published, and further particulars will be circulated from time to time.

In many districts in Queensland dairying may be carried on under the congenial conditions that are conducive to high quality production, and it is reasonable to expect that the average yield of milk per cow in Queensland should be greater than it actually is. It is realised that our averages are based on the production of all herds registered, without any regard to the fact that some herds are milked only during the period of the year in which the natural pastures are abundant. This practice obviously lowers the average production, as computed for statistical purposes, of our full-time dairy herds.

The records of the Department, however, indicate a very wide variation in the production of butter fat per cow in the herds tested (and it may be assumed that these herds are not below the average in output), and there is, therefore, considerable room for herd improvement in the State, a phase of the dairying industry to which the Department is giving full attention.

Every opportunity is taken of impressing the dairyman with the necessity of making adequate provision for the storage of fodder. It is recognised that, for various reasons, fodder conservation is not always practicable, and those who condemn the improvidence of the dairy farmer often fail to appreciate these circumstances. After making due allowance, however, for the difficulties facing some producers, the practice of providing ample stores of fodder is not as general as it should be, and it is a matter that calls for the serious consideration of every dairy farmer who aims to control a prosperous enterprise.

### **The Board of Agriculture.**

IN the course of the year the Board of Agriculture was constituted as a co-ordinating agency for the prevention of overlapping in scientific and other investigations designed to benefit agriculture in Queensland. A survey of the investigational work now proceeding has been made with a view to determining what overlapping, if any, exists, the measures to be adopted to secure effective co-ordination and co-operation, and other relevant matters. A register of agricultural research, experimental and demonstration work, has also been compiled for the information of the Board in formulating its plans.

### **Banana Experiment Stations.**

UNDER the provisions of "The Primary Produce Experiment Stations Act of 1927" it has been decided to establish two banana experiment stations, one at Kin Kin East, near Gympie, and the other at Pawnsilly, on the Russell River. They will, it is considered, meet the present requirements of the banana industry.

The main object of these stations is to enable the Department to carry out various forms of necessary research work, and to secure co-ordination among all concerned in the progress of primary industry.

These stations will be similar to the Sugar Experiment Stations already established in their operation and the character and quality of their service to the farming community. The approximate annual value of the banana industry is £1,000,000 sterling; and it is ordinarily a profitable enterprise capable of considerable improvement and much greater expansion. The upkeep of the stations will be a charge in the form of a levy on the industry which they benefit. The fund so accumulated will be subsidised. The principle is accepted that where growers are interested financially in a scheme they will take a more active interest in contributing to its success, and this will, no doubt, ensure complete co-operation between the Department and the farmers concerned.

Much useful work has already been performed in connection with the banana industry, and those engaged in it have, as a rule, applied themselves very closely to the problems with which it is beset, achieving some considerable results, but obviously much yet remains to be done.

There are large areas in the State suited to the cultivation of the fruit, and the districts in which the industry has been established are the main sources of supply for the Commonwealth. Experiments with bananas have been carried out in the North with a view to developing types suitable for the conditions in that part of the State; and the satisfactory results obtained have stimulated an extension of banana growing on our Northern littoral. There is room for much greater development, and this fact is recognised by, and is receiving the attention of, officers of the Fruit Branch.

### **Agricultural Experiment and Research.**

**F**ARMERS are appreciating more the value of experiment and research, for which such stations provide the facilities and the service, and are realising that this work affords the only sure means by which they can travel with any degree of satisfaction along the rough and often disappointing road of hard experience.

The establishment of boys' and girls' pig and poultry clubs, in co-operation with the Department of Public Instruction, also claimed attention in the course of the year. This movement has been marked by much enthusiasm among club members and their parents and teachers, and already it has produced some practical results. It expresses in a very useful way the advantage of keeping the young people on the farm in touch with the best in rural life and of developing natural qualities of leadership, responsibility, good citizenship, and community service.

Agriculture generally throughout the State is showing evidence of healthy progress, and the reports of the several branches of the Department will serve to indicate the systematic development of agriculture and stock-raising in Queensland.

The prospects for the coming year are promising. Winter rains have been general over the agricultural districts, and a good germination has been secured for plantings of root and fodder crops. Grass is plentiful in the coastal and nearer inland areas.

### **A Healthy Virile Race in the Tropical North.**

**W**RITING to the British Medical Journal, London, in reply to a published letter by Dr. Andrew Balfour, Sir James Barrett, of Melbourne, gives some information regarding tropical Queensland. He quotes figures of the Commonwealth Statistician (Mr. C. Wickens) showing that in 1921 the Italian-born population within the tropics represented 8.37 a 1,000, and south of the tropics 0.56 of the total population.

"It should be remembered," he adds, "that the State is divided into tropical and non-tropical Queensland. The distinction is arbitrary in one sense, as it is based on the Tropic of Capricorn, whereas the whole of Queensland is north of the 29th parallel. From Mr. Wickens's statement it will be seen that the answer to Dr. Balfour's suggestion that the white race in tropical Queensland is of Italian origin is that it is not correct. A healthy white race which is not Italian has been reared in tropical Queensland for several generations. The infantile and the adult death rates are lower than in almost any other place in the world, and the most thorough physiological investigations have shown no deterioration which can be measured by the means at our disposal. Towards the end of his letter Dr. Balfour refers to the low-lying littoral of tropical Queensland. Might I suggest that whether a country is low-lying or hilly tells us very little? It is the accurate record of the wet-bulb temperature that indicates the stress to which human beings are subjected. What may lie in the future I do not know, but I can definitely state that in tropical Queensland a vigorous white race, which contains only a small percentage of Italians, is being reared, and shows no signs of deterioration. In fact, the suggestion that there is deterioration, when made to some of the residents in tropical Queensland, is received with ridicule. Those who saw the soldiers Queensland sent to the front during the Great War will understand the incredulity."

## Bureau of Sugar Experiment Stations.

### OUTBREAK OF "WIREWORMS."

The Assistant Entomologist (Mr. A. N. Burns) stationed at Mackay has submitted the following report for the month ended 12th October, 1928, to the Director of the Bureau of Sugar Experiment Stations, Mr. H. T. Easterby:—

#### Severe Occurrence of Wireworms (*Elaterid* sp.) at Te Kowai.

During the latter part of last month attention was drawn to a serious outbreak of "wireworm" injury to young plant cane (Q. 813) at Te Kowai. A thorough inspection of the affected cane was accordingly made, and of the whole of the block, which comprised 6½ acres, fully 4 acres were completely destroyed. The field for the most part was fairly level, but the damage was greatest in the lowest and most poorly-drained portions. The soil was uniform greyish-brown sandy loam, and was very well worked, despite the very dry weather, and it contained a fair supply of moisture at the depth of the cane sets.

In places where the damage was most severe, about one set only in every dozen had survived and grown, some others had sent out shoots a few inches long, but they had been eaten below ground level, and in other cases the eyes had been destroyed as they were germinating. In many instances the wireworms had left the dead sets and moved along to others, and, in almost every case one wireworm only was found at each set. The plant itself was not bored into at the ends, nor were the roots eaten; the point of entry by the wireworm was invariably through a shoot or eye. In the case of the former, the interior was generally tunnelled out in the underground portion. The set or plant in many cases was injured only near the point of attachment of eyes or shoots, where the wireworms had "ringnecked" round it, following the junction of the internode nearest the attacked eye or shoot.

An adjoining block of H.Q. 426 had occasional sets destroyed here and there, but the injury was negligible, and, being a good "strike," this block showed up in marked contrast to the affected cane alongside.

The wireworms were identified as being larvæ of a species of the true *Elaterid* or "click" beetle type, and were of the flattened form of larva. They much resembled small larvæ of the large predatory *Elaterid*, *Agrypnus mastersi*, Puse. In length they measured approximately ¾ inch; the body is of a pale yellowish-cream colour, broadened laterally, giving a slightly flattened appearance; head dark reddish-brown; anal segment bearing a depressed plate, pale-brown.

Specimens were brought back to the laboratory, where they are being bred through to the beetle stage. They are voracious feeders, and are able to move very rapidly through the soil.

Prior to planting the cane in the above field, a crop of Mauritius Beans was grown on the land, and ploughed in. Owing, however, to the excessively wet weather of last February and March, the grower stated that the crop of beans was not nearly so heavy as he had anticipated. Had they been heavy when ploughed in, the subsequent damage from these wireworms might have been reduced a good deal. The ploughing-in of a leguminous crop has been recommended as a help in preventing outbreaks of these pests; the amount of organic matter added to the ground being food for the wireworms, and practically sufficient to sustain them without attacking the growing cane. The above crop of beans being poor might possibly have partially been the cause of so severe an outbreak, especially when combined with the abnormally dry weather at present being experienced, the wireworms having exhausted most of the organic matter in the soil of the affected area, and also seeking moisture.

#### French Cane Grubs Pupating (*Lepidiota frenchi* Blkb.).

Grubs of this beetle are now mostly all transformed into pupæ, the majority of those breeding at the laboratory having undergone the change a little over a week ago. The actual period spent in the pupa is comparatively brief when compared with the time spent by the grub in its pupal cell before actually pupating. This latter period has, in many instances, lasted as long as four months, whereas the pupal period occupies normally slightly less than a month. Now that there has been an opportunity of working out the larval stages of this cane beetle in the Mackay district, the two-year life cycle may be divided up as follows:—Eggs deposited by beetles usually about December. Between two and three weeks elapse before the young grubs emerge in the first stage. The time occupied in this instar is variable,

but is usually from about January till May; some grubs, however, were still in the first stage late in June. Second-stage grubs occur from about July to October; at the time of writing some grubs are still to be found in this stage. The periods of time spent in the different stages overlap a good deal. The third and final grub stage is generally reached about November, from when the grubs continue to feed until May. They then burrow deeper down into the soil and form their pupal cells, the remaining time before emerging as beetles being spent as abovementioned in the prepupal and pupal stages.

#### **Greyback Grubs also Pupating (*Lepidoderma albobirtum* Waterh.).**

Third-stage grubs of this notorious beetle are also at present undergoing the change into pupæ, and, in the majority of cases, about two weeks later than those of *L. frenchi*. This, no doubt, accounts for the latter species occurring on the wing in the Mackay district slightly earlier than the greyback, which, in the Cairns and other far-northern districts, usually appears just in advance of *L. frenchi*.

All the stages from the egg up to the pupa of this beetle have now been bred at the laboratory, and the following data regarding the times of occurrence of each stage have been gathered. Eggs laid by beetles in December and early January (in ordinary seasons), grubs in the first stage from January to about the middle of March, in the second stage from late February till April, and in the third stage from April till October. Not nearly so long a time is spent by *albobirtum* grubs in the prepupal stage as is the case with *L. frenchi*. Specimens now pupating were active and feeding in July and even August, which makes the "resting" period before changing into pupæ in the pupal cells about two months—just half as long as that of *L. frenchi*. The pupal stage occupies approximately four weeks, and the newly-emerged beetle remains in its cell for several weeks, or even months, if the weather be very dry, before finally emerging from the soil. The emergence from the ground of the beetles is controlled by the advent of the first soaking summer rains; the beetles generally appearing a day or two after these. Should a prolonged dry spell occur, however, emergence is retarded, and very frequently numbers of beetles perish in their cells, being unable to escape owing to the hardness of the ground.

#### **Dasygnathus Beetles now in Cells (*Dasygnathus australis-dejeani* Blkb.).**

Beetles of this species are now present in numbers in their cells, doubtless awaiting the first early rains to enable them to escape from the soil. A large number of third-stage grubs were collected during last March and April from canefields; most of these pupated about the middle of August, making the duration of the third-grub stage about five months. On an average from six weeks to two months is spent in the prepupal state, and some three weeks only in the actual pupa. Many of the beetles bred at the laboratory have quite "hardened," and no doubt an emergence of this species will take place immediately following the first rains. The weather during the past five months has been exceptionally dry, and, in consequence, the ground in many places has become extremely dry and hard. Abnormally dry conditions such as these would probably tend to slightly lengthen the period of development of pupæ in the soil, so that it is probable if rain had fallen recently there would have been a primary emergence of this beetle.

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### **CANE PESTS AND DISEASES.**

*Mr. G. Bates, Assistant to Entomologist at the Sugar Experiment Station, Bundaberg, reports for the period July-August, 1928:—*

#### **Effect of Sorghum on Cane Grubs.**

In the course of investigations the theory has often been advanced by growers that the plunging-in of young sorghum will kill any grubs that may happen to be in the soil. This impression, no doubt, originated in the fact that sorghum, when young, contains hydrocyanic acid. This is a deadly poison and is frequently responsible for deaths among cattle that have chanced to eat a small quantity of young sorghum, but the idea that it will kill grubs is quite erroneous, and has been clearly demonstrated in both the laboratory and field.

Mr. E. Jarvis, Entomologist of the Bureau, carried out laboratory experiments in this direction in 1921 regarding the effect of poisonous plants on cane grubs, and among other things young sorghum was given a trial. Results showed that grubs "were not injuriously affected, but, on the contrary, appeared plumper and more active."

Regarding field tests, opportunity has been afforded us to witness a trial carried out by a grower in this district on land subject to grub attack. Desirous of planting a crop for green manure, and having heard of instances where the ploughing-in of young sorghum has been credited with killing grubs, he decided to conduct a trial, thinking that perhaps the southern grubs being of a different species from those of North Queensland, the results may be somewhat different. It was therefore arranged that, when planting, a strip would be left bare so as to provide a check plot.

This block was ploughed in December, and although rather old the sorghum was still in a condition that would kill stock if they chanced to eat it. This land was ploughed again in February and April, and on both occasions young sorghum was turned under, this being a volunteer crop, the result of wet weather preventing the stools being entirely killed during previous cultural operations. The land was given further cultivation during August, and on each occasion when ploughing, grubs were found to be numerous and quite healthy.

This field test merely confirms the laboratory experiments—that ploughing-in young sorghum will not exercise any control over cane grubs.

### Rats.

Reports of damage by rats in canefields in this district have recently been brought under the notice of this Experiment Station, damage occurring on some low-lying country close to the river.

The damage caused by rats is familiar to most growers, and is often of a serious nature. Various poisons have been recommended for the control of these pests, such as strychnine, phosphorus, arsenic oxide, and barium carbonate. In Hawaii, where rats were doing extensive damage, the best results were obtained from the use of barium carbonate biscuits, and good results have also been obtained from this poison in North Queensland.

In one instance which came under our notice, both Q. 813 and H.Q. 285 were being damaged, and as the loss was appreciable and likely to become worse, it was recommended to poison with barium carbonate biscuits. This was done, and a fortnight after spreading the bait an inspection showed very little fresh damage, the old damage being recognised by the eaten portions being dry and red, or else dried up altogether and brown. This field was examined a second time three weeks after spreading the poison, and in only one part of the field was any freshly eaten cane found. This consisted of only three sticks, located where the damage was worst. Very little cane was freshly damaged compared with the amount seen when spreading the poison. This result is extremely satisfactory, and any grower who is troubled by rats is advised to give this method a trial.

The following formula was the one used, and is identical with that used by the Mulgrave mill, to whom we are indebted for particulars concerning their use of this poison against rats:—

Barium carbonate	..	..	..	..	..	10½ lb.
Flour	..	..	..	..	..	2½ lb.
Pollard	..	..	..	..	..	4 lb.
Tallow	..	..	..	..	..	6 lb.
Salt	..	..	..	..	..	9½ oz.
Water	..	..	..	..	..	5½ pints
Aniseed oil	..	..	..	..	..	½ oz.

Mix the barium carbonate, flour, and pollard dry. Melt the tallow and mix in roughly. Dissolve the salt in the water and add slowly, making the whole into a stiff dough. Roll out to a quarter of an inch thick, cut up into pieces  $\frac{1}{2}$  inch by  $\frac{1}{2}$  inch, and bake until dry. Then mix the aniseed oil with an equal quantity of water and spray over the biscuits. The bait is then ready for use. It is advisable to handle the biscuits as little as possible, and to rub oil of aniseed on the hands when putting out the poison. This mixture is both cheap and effective, and has the further advantage of not being highly poisonous to stock, fowls, dogs, and humans, although only a small quantity is required to kill a rat. Barium carbonate can be purchased for 1s. per lb., and the other ingredients are also inexpensive. Made up in this manner, one-third of a biscuit will kill a rat; so that the quantity to spread per acre will naturally depend on the number of rats in the field. Scatter six biscuits every 5 yards along headlands, edges of creeks, &c., where rats are harbouring, and walk through the cane along every twentieth row scattering bait at the rate of six every 10 yards. This is only a guide, as rats may be damaging cane in only one corner of the block; so that no hard-and-fast rule can be laid down, and the quantity put out must be left more or less to the discretion of the person using the poison.

Furthermore, for the efficient control of rats, places which harbour them, such as dirty headlands, creeks, and gullies, should be cleaned up and not allowed to remain as a breeding ground.

**RESISTANCE OF VARIETIES OF SUGAR CANE TO DISEASE.**

Mr. A. F. Bell, who is in charge of the pathological investigations of the Bureau of Sugar Experiment Stations, states that after consultation with the Pathologist to the Colonial Sugar Refining Company in New South Wales (Mr. D. S. North) it was decided to use the following four classes to describe the relative resistance of any cane variety to disease:—

*A. Commercially Immune.*

This class includes those varieties in which the disease has never, or only very rarely, been observed, although such varieties have been exposed to sources of infection over a period of years.

*B. Highly Resistant.*

Varieties in this class can be grown in the presence of the disease without any precautions.

*C. Moderately Resistant.*

Varieties in this class can be grown in the presence of the disease, provided that suitable precautions are taken.

*D. Susceptibility.*

It is unsafe to grow varieties of this class in the presence or vicinity of the disease, in spite of the exercise of all reasonable precautions.



PLATE 113.—THE CASE OF THE "BAG WORM"—A MINOR SUGAR-CANE PEST.

### DIVISION OF PATHOLOGY.

*The Director of the Bureau of Sugar Experiment Stations has received the following report upon the work of the Division of Pathology during the month of August, from Mr. A. F. Bell, Pathologist:—*

#### Cane in Private Gardens.

Arrangements have been made to grow a number of varieties of Queensland cane in isolation in private gardens in Brisbane. One variety will be planted in each garden, and these will be inspected periodically, and if found to be healthy will supply a nucleus of clean seed for the proposed variety garden.

#### Distribution of Gumming Resistant Canes.

Under the supervision of this division, small parcels of S.C. 12/4 and B.H. 10/12 have been sent to selected parties. The recipients of the canes have been asked to grow them in isolation in order to propagate disease-free stocks.

#### Gumming Resistant Trials.

I spent some two weeks in the Bundaberg district, inspecting farms in order to get disease-free seed for the purpose of laying out a gumming resistance trial at the Bundaberg Experiment Station. The following varieties have been included:—Orambo, Nanemo, Korpi, B.H. 10/12, S.C. 12/4 P.O.J. 2714, Q. 813, Q. 812 A, Uba, Badila, M. 55, Co. 210, Co. 213, Co. 227, Black Innis, 1900 S., D. 1135, and Assam Red. Two plots of two rows of the first four varieties, and four plots of the other varieties have been planted out, the standards being 1900 S., and D. 1135, each variety being in contact with both standards.

#### Yield Trial.

A yield trial of the gumming resistant canes Co. 210, Co. 213, and Co. 227, was laid out with Q. 813 as standards, there being four repetitions of each variety.

#### Meetings.

Three meetings of farmers were addressed by me while in the Bundaberg district, and particular emphasis was placed on the need for isolation nurseries. I also met the district executive and discussed this matter; they have undertaken to circularise farmers with a view to finding suitable locations for clean seed nurseries.

Mr. Kelly also addressed a gathering at Mulgrave.

#### Sectional Chlorosis and Tangle Top.

Sectional chlorosis is very common all over Queensland this year, and particularly so in the Bundaberg area. Several cases were recorded where the collapse of the leaves, following sectional chlorosis, had caused tangle top, and ultimately, in some cases, the death of the cane. An article for publication will be prepared on this subject in the near future.

#### Applications for Permits to Sell Seed.

A number of applications for permits to sell seed have been received from growers on the Gayndah line. A good deal of inconvenience is caused in making separate visits to these localities, and next year it may be necessary to control the time of application somewhat.

#### Badila from Wolvi.

The chemist in charge at Bundaberg made arrangements to receive a small crate of Badila from Mr. J. H. Thornton, of Wolvi. This cane will be planted on the Station, and observations made on the time elapsing before it becomes infected with gumming.

#### Lake Barrine Nursery.

This was inspected on 11th July and 6th August, and no trace of disease found, although the cold weather has been responsible for slow growth, and army worms are proving troublesome.

**MOSSMAN DISTRICT.**

The district survey was completed by Mr. Kelly on 3rd August. Leaf Scald was found on practically all of the farms inspected, the most commonly infected variety being H.Q. 426. Suggestions were made that an isolation nursery should be started in the Daintree district. Leaf Stripe was seen wherever B. 147 was grown, and was also occasionally seen in D. 1135, Pompey, Q. 813, Badila Seedling, M.Q. 1, Badila, N.G. 24, and M. 55/1182. Scattered cases of Red Rot were noted. Spindle Top was noted, chiefly in Badila, and in most instances was directly traceable to injury by pests.

**GORDONVALE DISTRICT.**

The inspection of this district was completed by Mr. Kelly on 25th August, and the following is a summary of the diseases found:—

Farms inspected	..	..	42	Gumming	..	..	1
Leaf Scald	..	..	42	Spindle Top	..	..	28
Leaf Stripe	..	..	1	Red Rot	..	..	3
Mosaic	..	..	4	Rind Fungus	..	..	1

Special visits were also made to a number of farms when the source of seed suggested that they might have cane infected with Leaf Stripe or Mosaic.

Canes which had recently been imported from southern districts were also inspected for possible gumming, but were found to be free.

The area in which Mosaic has been found will be reduced from 89 to 50 acres this year.

The H. 109 at Aloomba, in which gumming was found, is dying from this disease in places; this cane and the adjoining Badila are to be ploughed out next month.

Mr. Kelly also reports the successful use of the barium biscuit in combating the ravages of rats.

**MARYBOROUGH DISTRICT.**

During the month, farms which were expected to be relatively free from diseases were given a final inspection, and a long list of permits granted; these have already been published in suitable channels.

The final figures showing the distribution of disease are as under:—

Place.	Number of Farms Visited.	Mosaic.	Gumming.	Fiji.
Walker's Point .. .. .	12	2	..	4
Island Plantation .. .. .	46	14	1	12
Prawl, Dundathu, Pialba Road .. .. .	11	2	..	1
Mungar, Antigua, Oakhurst, &c. .. .. .	19	11	..	6
Iindah, Eton Vale .. .. .	18	10	..	5
Nerada, Tinana, from Bridge .. .. .	17	8	..	10
Teddington Road .. .. .	13	2	..	3
The Pocket .. .. .	5	1	2	4
Queen Street .. .. .	6	1	..	6
Granville .. .. .	9	2	..	6
Magnolia .. .. .	23	15	..	13
Gympie Road .. .. .	17	3	..	3
Totals .. .. .	196	71	3	73

**NAMBOUR DISTRICT.**

During the inspection of this district, fifty-seven farms were visited, and practically all found to be infested with gumming, twenty-five with Mosaic, and four with Fiji. The percentage of Mosaic is low, averaging less than .5 per cent. on the infected farms, and as farmers are roguing, the position is not serious. The reason for the outbreak of Fiji disease is still a mystery, but the disease is not widespread. The gumming situation is bad, and requires the establishing of nurseries of clean seed in order to control it. Q. 813 is showing practically no trace of gumming and is doing well on the higher river soils, but is not adapted to wet conditions. Badila,

H.Q. 285, N.G. 16, and D. 1135, are rather badly affected. Uba does not appear to be suited to many parts of this district. One farmer (J. Blanche) has a few stools of P.O.J. 2714 which appear to be doing well, although planted in a swampy patch.

#### Clean Seed for Nambour District.

In response to a request from the Secretary of the Nambour Cane Growers' Association, Mr. Wood was despatched to the Pialba district to make the necessary inspection of farms. The secretary was advised that permits had been issued to the following growers:—Messrs. O. Wendland, R. Wood, O. Moes, Nikenbah; —. Cadell, Kawungan; and J. E. and R. Cormie, Box 10, Pialba.

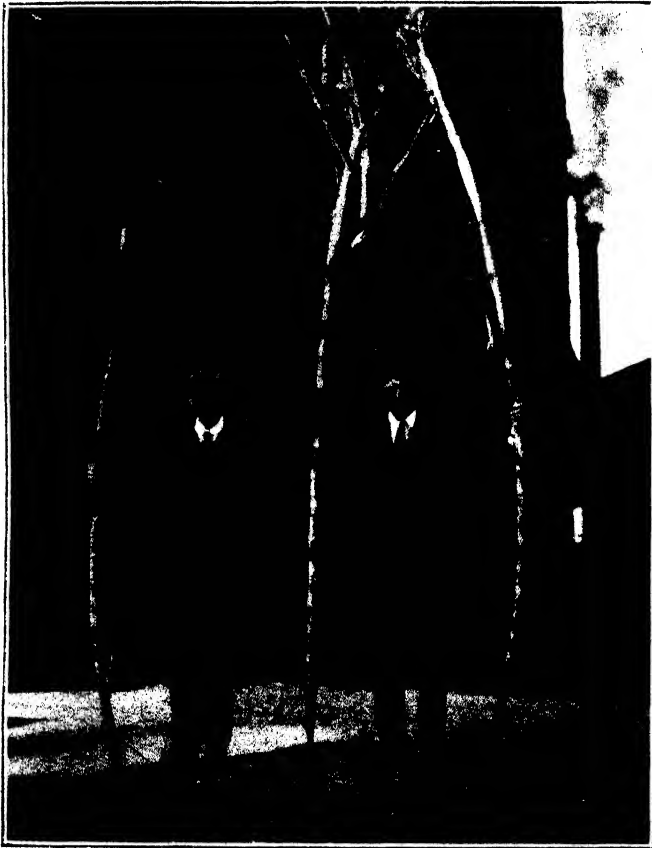
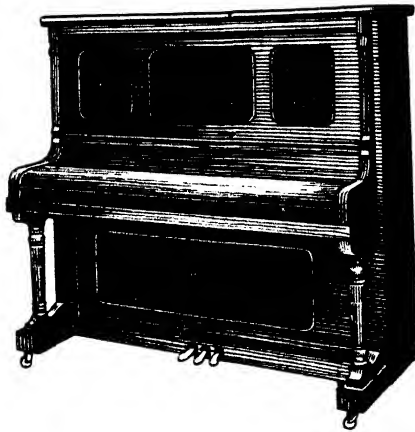


PLATE 114.—SPECIMENS OF S.C. 12 (4) FIRST RATOONS (12 MONTHS OLD) GROWN IN BOTANIC GARDENS FOR SUGAR BUREAU.

In the picture are Mr. H. T. Eastorby, Director of the Bureau of Sugar Experiment Stations and Mr. Ferguson Wood of the Bureau Staff.

This cane was received by the Bureau of Sugar Experiment Stations in 1926 and planted in quarantine in the Botanic Gardens.

The photograph is of first ratoons, twelve months old. This cane is highly resistant to the gumming disease in Porto Rico, and was imported for the purpose of trying it in this respect in Queensland.



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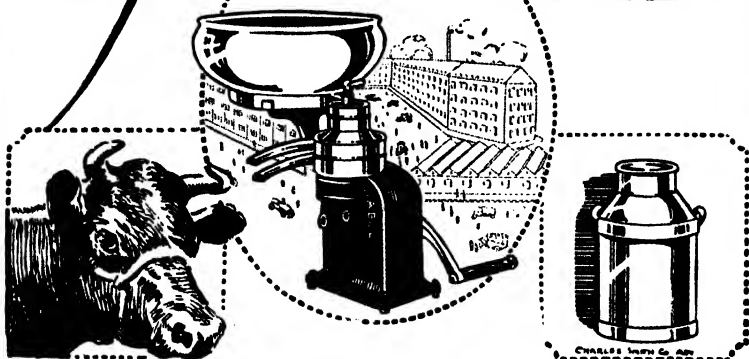
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## FIELD REPORTS.

*The Northern Field Officer, Mr. A. P. Gibson, reports (13th September, 1928):—*

### TULLY.

#### Weather.

The total absence of rain and higher day temperatures during the last two weeks mark the real commencement of summer.

Fifty-three inches of rain were recorded at Ingham to the end of August. Tully, some 58 miles northward, registered 122 inches for the same period; 4.70 inches fell during the month of August.

#### Progress.

The progress of the industry here has been rapid, and may be judged by the extraordinary growth of the town and district. What was great scrub country a few years ago is now an immense canefield, dotted with homes and intersected with roads or railroads, and has a very modern telephone service.

#### Soils.

The future wealth of this district depends entirely on sugar—the one big product—and the richness of its soil. Here it is alluvial and varies much in colour, depth, quality, and texture, as most other water-formed soils do. The more fruitful soil is to be found back at various widths from the River Tully and the lesser creeks. It seems unfortunate that some upland country has been bared of its dense vegetation and planted to cane when there is ever so much more superior level land. The soil differs on this rough country; it is coarse grained and reddish in colour; such hilly country is always more costly to cultivate and harvest, and is also responsible for much truck wrecking and a probable rainfall reduction. Some parts of the world are striving to cover with vegetation their bared heights, mainly with the object of increasing the rainfall.

#### The Crop.

About 99 per cent. of the crop is Badila (N.G. 15); it is expected to yield in the vicinity of 225,000 tons, and is cutting satisfactorily. Upwards of 70 tons per acre have been cut in places. Cane grubs, abnormal tasselling, and much spindle top are factors responsible for a diminished yield in other parts. Despite these reducing mediums, the grand crop summary will probably over-shadow the record by some 20,000 tons.

#### Harvesting.

Perfect weather conditions prevail for this class of work. Generally speaking, the harvested cane is very dirty. Improper ground cutting was noted.

#### Milling.

The mill is not so far advanced with its crushing as might be expected owing to time being lost by a strike and an inadequate cane supply at times. Much burnt cane was being milled when the area was inspected—the reported results of many big accidental or mystery cane fires. The dry weather has permitted speedy cane ripening. Last week the mill average was 14.72 per cent. c.e.s.; the seasonal average is slightly under 13 per cent. c.e.s. About 119,000 tons had passed between the crushers to the 15th September; this is over the half-way mark.

Sugar storing has been made compulsory owing to the water-front trouble. Sugar storing means extra handling, which increases the cost of manufacture, and also helps to lower the quality.

#### Fired Cane.

When cane is fired, its cells perish; they cease functioning, cane weight is reduced, and, if it is not immediately milled, quickly ferments. This, together with improperly harvested cane, considerably reduces the factory efficiency. Farmers should endeavour early in the season to harvest such fields that would serve as handy fire breaks, thus reducing the possibility of big fires. They should also safeguard the areas more by paying greater attention to burning stumps and logs.

### Varieties.

Badila is the major cane grown. A small percentage of H.Q. 426 is planted to fill in the gaps, mainly because it is a good germinator and a speedy grower. Some Korpi and 7 R. 428 were noted. A few stools of the Hawaiian cane, H. 109, were seen. Out Syndicate way this looked well; the stems were fully 12 feet long and very straight, standing much higher than the Badila growing round it.

### Cultivation.

More land annually is made ploughable by the removal of stumps, roots, and logs. Tractors, fires, and explosives are wonderful helpers in this class of work. Drawing logs together or completely removing them from the field minimises considerably manual labour of the back-breaking type, for it permits the use of animal-drawn light implements, which, when timely used, reduce hoeing and subsequent harvesting rates, and also permit soil sweetening. Some "hurry-up" tilling was noted; several farmers had actually replanted between the old stubbles. Others have ploughed out badly the cane stools cut this year and immediately replanted; some of the old stools were growing again among the new germinating crop, or lay thickly strewn over the surface, which must naturally hinder all subsequent interspace tilling. When these are removed from the field and not ploughed under, soil humus is reduced considerably.

### Planting.

Spade holing for planting the first crop is usual. Rag-topped alignment and row-spacing sticks some 12 feet long are placed 5 feet apart and distant 3 or 4 chains. It is advisable to sink cane holes 12 inches by 8 inches by 8 inches and 24 inches by 30 inches apart. Good disease-free seed only should be placed on the loosened bottom soil in the hole and the plant lightly covered. It is common here to see inferior seed placed on the hard pan of too small and shallow a hole; small wonder that many of the Tully canefields have to be renewed before their time. High ground cutting, especially the plant cane, is a tragedy; this, coupled with improper drainage and shallow planting, is responsible for much spindle top and some poor ratoons.

### Ploughing.

This at all times should be thorough, and the depth regulated according to the quantity of surface soil. Too deep ploughing in some soils is detrimental rather than beneficial.

### Weeds.

Commonly known as blue-top, Commonwealth, and Ink weed quickly grow in profusion immediately after scrub firing; every endeavour should be made to control these before they seed.

### Manuring.

It seems obvious that most of the land here will require heavy feeding to keep it fruitful. The price of fertilisers, combined with some low cane prices (the result of surplus sugar), will doubtless have the tendency of putting out of action for cane-growing a percentage of the less fertile land, or some fields growing Badila to-day will be called upon to produce instead a more profitable kind. There is, however, an abundance of surrounding good land, more of which will be wanted in the near future to make good the diminished supply. Owing to the newness and varied nature of the soil, it is difficult to advise with any degree of certainty the most profitable manure to apply until some soil analysis and field trials have been conducted. Nitrogen apparently is wanted. Lime would improve the cohesive ill-drained soils, but its price almost prohibits its use. Humus should be maintained; much surface mould is lost when the fallen scrub is burned. An abundant supply of humus in the soil improves its texture and arrests plant food leaching during periods of excessive wetness.

Yellow cane leaves were noted in isolated patches of new ratoons, apparently due to the lack of plant foods.

### Drainage.

An improved system is urgently required on the shallower soils overlying an impervious sub-strata. When the soil becomes super-saturated with water and remains so for any length of time, cane roots perish. The anchorage is reduced and the top suffers, even falls.

**Pests.**

The environment is most suitable for the rapid increase of rats. Grubs have been responsible for greater losses than is generally thought. Wallabies and wild pigs are numerous, and have occasioned damage in isolated spots. Army caterpillars have in some fields devoured most of the crop foliage, in some instances, not even leaving the leaf mid-rib. *Pentodon australis* (a black beetle) and larvæ of the tineid moth were found destroying some lesser plant and ratoon shoots. Weevil borers were noted in harvested cane coming from the settlement.

**1929 Prospects.**

It is yet too early to predict what the ensuing harvest will be. At the moment the stand of cane (save parts) is patchy and lacks a dark-green colour, suggesting that nitrogen is wanted. Its general appearance is less favourable than the present one was at the same time last year.

Unmanured cane in the area seemed to have tasselled most. It is known that manuring and irrigation have arrested arrowing in the territory of Hawaii.

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*The Northern Field Assistant, Mr. A. P. Gibson, has submitted the following report on the Herbert River Sugar-cane producing area, inspected 14th to 30th August, to the Director of the Bureau of Sugar Experiment Stations (Mr. H. T. Easterby):—*

**HERBERT.****Weather.**

High day temperatures and cool nights have been the rule. The main feature of the month is the scanty rainfall. Earlier in the year parts of this big agricultural district were favoured with some beneficial rain, but very little has fallen during the last four months. A good general fall is urgently needed to replenish the now depleted surface water supply, also to freshen the parched vegetation.

**Rainfall.**

		Ingham.		Halifax.
		Inches.		Inches.
January	.. .. .	7.29	..	6.27
February	.. .. .	31.45	..	27.56
March	.. .. .	6.89	..	10.11
April	.. .. .	2.93	..	1.29
May	.. .. .	1.17	..	0.84
June	.. .. .	2.14	..	2.54
July	.. .. .	0.73	..	1.14
August	.. .. .	0.64	..	0.18
		53.24 inches.		49.93 inches.

**Progress.**

This area is recognised as one of the best in Queensland. The district and town have made extraordinary progress despite the great setback of the 1927 record flood.

The present crop is the largest yet experienced, so far as tonnage is concerned. The green foliage of the matured crop, especially that of variety H.Q. 409 is heavily blanketed with a fading brown mass of feathery tassels, the fuzz from which is tumbling fast. The large crop is mainly due to the increased area planted to cane, the abnormal amount of plant, and a subsequent favourable season.

**Harvesting and Milling.**

Up to the present the weather has been very suitable: consequently, operations in field and mill have proceeded uninterruptedly and with amazing speed. Some varieties have tasselled more than ever before, and now possess large stem side shoots which are gradually reducing the weight of the cane, and increasing the cane-cleaning difficulties. The district is panning out in the vicinity of 20 tons per acre. Tractors

are largely used for hauling the loaded cane trucks over portables from field to permanent way. It is pleasing to the farmer to find his crop harvesting heavier than was estimated. Practically all the cane being milled is unburnt, and, owing to the absence of high winds, is straight, lengthy, of excellent appearance, and wondrously clean. Many years have elapsed since the writer has seen better harvested or cleaner cane than that coming forward to the Victoria mill; its condition is a credit to those responsible. Clean cane is very desirable and helpful for efficient mill work.

The two factories are both working to their fullest capacity, making good progress considering the size of their crushers. The record crop estimated at 477,000 tons is being reduced by 15,500 tons weekly. If this remarkably high weekly rate is continued, the district's greatest crop will be fully milled by the end of the year.

#### Estimates, and some Factory Particulars.

Mill.	Estimate.	Cane Milled up to 26th August.	Greatest Tonnage Crushed per week.	Per cent. of Clean Cane.
	Tons.	Tons.	Tons.	
Macknade ..	225,000	128,000	8,326	96.3
Victoria ..	252,000	110,000	7,415	97.7
	477,000	238,000		

Half the estimated crop has been crushed. Macknade has averaged 8,000 tons a week since starting; Victoria, during the last eight weeks, has averaged over 7,000 tons. Two very old beam crushing engines at Macknade (Darby and Joan) must be giving efficient service. This mill will probably complete its assigned cane about the end of November, after which it may assist its sister mill to finish.

#### Cultivation.

The weather being favourable, ratooning, ploughing, planting, and interspace tilling are being hurried along. Most of the cane is hand planted. Poor plant germination has occasioned extra work in filling the great gaps among the plant cane. The work in nutgrass fields has to be continued until the foliage covers the row. In some instances tractors are working day and night, immediately ploughing out exhausted stubbles and planting. This is bad practice on the soil and industry at present. It is difficult to get the farmers to grasp the great value of seed selection. Throwing whole canes into cane drills and cutting to lengths as they lie is not plant selection. Eyeless canes, the result of rats, larva of the bud moth or a careless harvester were noted lying in drills where this type of planting was being conducted. H.Q. 409 is obviously a popular variety for the wet shallow lands. This kind tasselled some weeks ago, and is now carrying great side shoots. These have reduced the top 14 inches or more of affected canes to pith and rind, and must, if planted, result in a miss. Headland ploughing after the final ploughing, is necessary, yet is too commonly neglected. A furrow made along the sides of the cane rows prior to planting prevents ragged ends, and also improves the field appearance. Earthing up is frequently overdone; this is a necessary evil and is done to a greater extent in nutgrass land to smother the thick weed growth surrounding the young cane. A bit of new road land recently cleared of guava and burr was planted to cane with the rest of an adjoining field at Halifax. This forged ahead of the rest, and when seen was outstanding in colour, growth, and stooling.

#### Varieties.

The major varieties grown in the area are as follows:—Badila, H.Q. 409, Korpi, Oramboo, Nanmo, and Q. 813.

#### Fertilisers and Drainage.

Lime is indispensable to the growth of cane; more of it and a better drainage system would improve the mechanical condition of the soil on many local farms. Large quantities of manure are applied to plant and ratoons annually, and at rates varying from 2 to 5 cwt. per acre with reported beneficial results.

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**Dominant Weeds.**

Much vacant land is being rapidly covered with a rampant growth of burrs and guava; over-wide roads are responsible for its spread. Nutgrass and guinea grass continue to spread. Real Johnson grass is to be dreaded in the cultural lands and should be controlled where possible. One farmer claims to be keeping it down by the timely use of the scythe.

**Pests.**

The most serious cane enemy here is the field rat; the district's environment is highly suitable for its increase. The need of doing something to control this pest is becoming more pronounced. As the season advances crop destruction must increase, due to the fact that the enemy is being continuously driven from the cut to uncut fields. Rats nest mainly in the ground or about a foot off it in the cane stools. The main injury is the devouring of eyes and the internodes to such a degree that the stem breaks off. This diminishes the sugar content and weight, and increases harvesting costs. Clean field surroundings and the use of poison baits have been successful in controlling this pest. The barium carbonate biscuit has proved effective in the Territory of Hawaii, and also in Queensland areas. Three pence per rat tail is being paid in some parts of the district.

**Shoot Killers.**

*Pentodon australis* (a black beetle) larvæ of the tineid moth and big moth borer, also some grubs, were noted.

**Foliage Eaters.**

During a dry time wallabies are more destructive, and army worms damage the crops.

A judicious attempt is being made to arrest the big river bank erosion on the seaward side of Halifax. A pile-driver is driving red mangrove piles about 24 feet by 6 inches closely together in the soil along the exposed bank.

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**SAN JOSÉ SCALE.**

F. L. JARDINE, Inspector of Diseases in Plants.

One of the most deadly enemies of the fruitgrowers of the Granite Belt is the San José scale, and, though this small insect is rather hard to detect in its earliest stages of infestation, if it is left unchecked it very soon establishes itself to such an extent that it may well be termed one of the worst tree killers to growers of deciduous fruits.

To those growers who are fortunate enough not to have this scale in their orchards and also to those who have not noticed it, it might be as well to point out a few symptoms which may help to detect any trees that have perhaps escaped notice.

The adult insect has a greyish-brown covering, and where a tree is badly infested it has the appearance from a short distance of having been dusted with fine wood ashes; also any tree that shows signs of gumming is well worth investigation, because where San José scale has been left unchecked for a period, gumming of the tree, or the portion affected, generally follows, prior to the dying of the tree or the affected part.

Growers will be well advised, in their own interests and in the interests of their district generally, to make a concerted effort to keep this scale in check and so control a deadly enemy to their trees and an expensive one to exterminate. San José scale can only be fought effectively during the winter months, when oil and lime sulphur sprays can be used at their full strength, and it is then that the orchardist should keep a close watch, and any tree harbouring scale should be tagged or marked by tying on strips of cloth, thus keeping this particular tree under notice.

When the usual winter spraying is in full swing, special attention should be given to the marked trees by giving them a thorough washing, and in cases where the infestation is very bad, two or more good sprayings will be necessary. These may be given at intervals while general winter spraying operations are in progress.

## DISEASES OF THE BANANA IN QUEENSLAND.

By J. H. SIMMONDS, M.Sc., Plant Pathologist.

**I**N the early days of the banana industry in Queensland there appears to have been little in the way of disease to trouble the grower. As the industry expanded several maladies came under notice. A few of these, such as Bunchy Top and Leaf Spot, may be considered of a somewhat serious nature, while others such as the fruit rots, Panama and Dry Rot, are for various reasons usually of only minor and local importance. With a view to enabling growers to become familiar with the commoner diseases as they occur in Queensland, there is given in the following pages short descriptions of these, together, where possible, with recommendations for control.

### BUNCHY TOP.

Bunchy Top is by far the most serious disease affecting the prosperity of the banana-grower in Queensland. In northern New South Wales and the extreme southern portion of coastal Queensland the once thriving banana-growing industry has, for the time being, been practically wiped out by the ravages of this malady. A similar fate awaits those districts so far free or only lightly affected unless the recommendations designed for the exclusion and control of the disease are strictly adhered to.

The first definite recognition of the presence in Australia of the disease now known as Bunchy Top occurred in 1913. Apparently it was introduced by means of infected suckers imported from Fiji, where the disease had been prevalent for many years. In 1922 the trouble began to assume such serious proportions as to call for special investigation by the officers of the two States concerned. Finally, in 1924, on the recommendation of a Board representing the Commonwealth Institute of Science and Industry and the Agricultural Departments of New South Wales and Queensland, the Bunchy Top Investigation was appointed consisting of Professor E. J. Goddard (Supervisor), Mr. C. P. J. Magee (Assistant Plant Pathologist), and Mr. H. Collard (Horticulturist). The expenses entailed were met co-operatively by the Commonwealth and the Departments of the States concerned. In Bulletin No. 30 of the Council for Scientific and Industrial Research, Mr. Magee has detailed the results of the investigation, and the nature of the disease and its means of transmission are shown to have been clearly demonstrated, with the result that sound control measures may now be advocated.

### Symptoms.

The appearance of a typical Bunchy Top plant showing the later stages of the disease is such as cannot readily be confused with any other banana malady. However, for the purposes of prosecuting efficient control measures it is necessary to be able to detect the first visible symptoms of the disease. These can be searched for by holding the lower part of the youngest leaf of the plant so as to look at it from the back with the light shining through. If the plant has become infected there will be noticed short broken lines of a dark-green colour lying between and parallel to the clear veins which run out at right angles to the midrib. The dark streaks are broken up into short irregular lengths so as to resemble the signs of the Morse code. (Plate 115.)

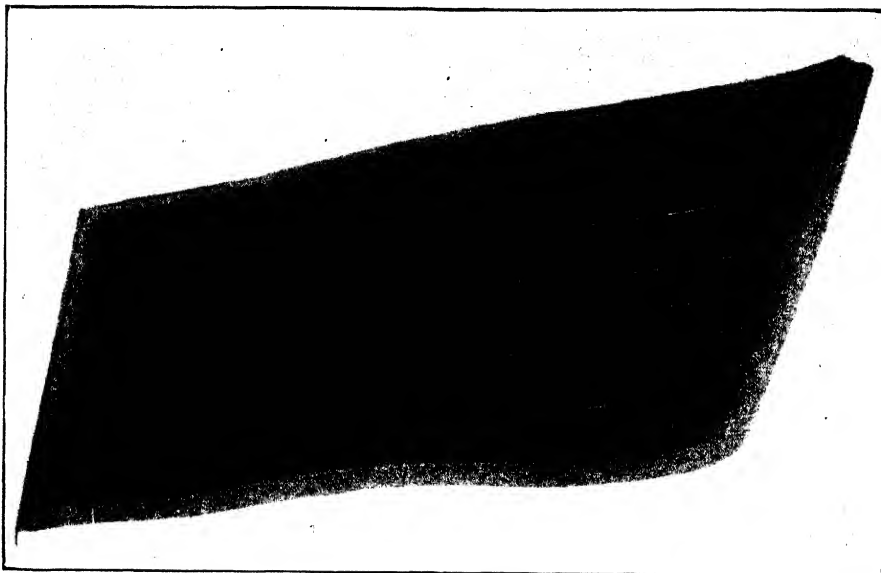


PLATE 115.

A portion from the base of a leaf of a Bunchy Top plant, photographed from the under side by transmitted light, showing the characteristic lines of dots and dashes.

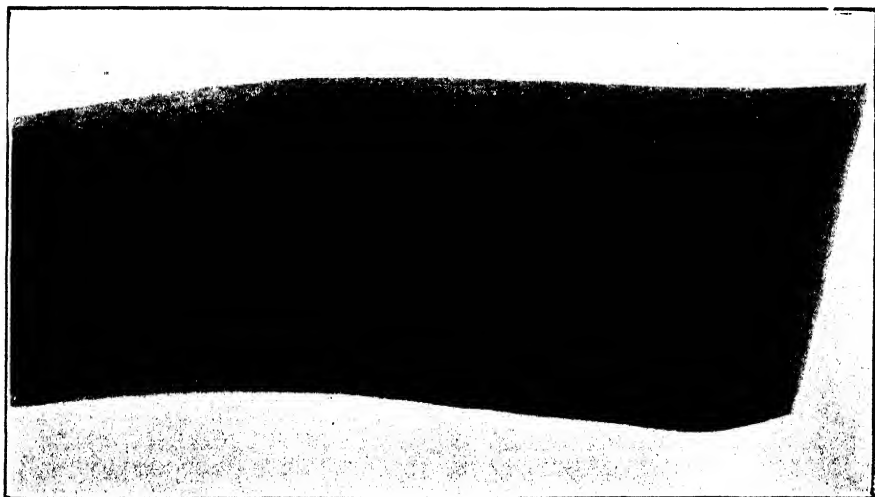


PLATE 116.

A portion of a leaf from a healthy plant photographed in a similar manner to Plate 115.

At first the dots and dashes may be somewhat sparsely scattered, but in the later stages of attack these may be so numerous as to form almost continuous dark-green lines, which give to the affected leaf a somewhat darker green appearance than normal. All the leaves subsequently formed exhibit evidence of the disease and to an increasing extent.

The following additional symptoms usually only appear three weeks or more after the marking just described first becomes visible. Suckers infected from the parent, however, may exhibit them from the start and to even greater intensity. Instead of waiting until it is properly free from the pseudo-stem the newly-thrown leaf will commence unfolding from the top in a funnel-shaped manner. The leaves become reduced in length and width until they are of a somewhat elliptical shape. The blade shows a tendency to droop along the midrib so that the backs of each side approach one another. The edges are rather more wavy than usual and are sometimes slightly curled inwards. Affected leaves exhibit a marked brittleness not natural to the healthy plant. Instead of increasing in size in their order of growth, the leaves of a Bunchy Top plant gradually become smaller. The leaf stalk also fails to elongate and bears the leaf in a more erect manner. The result is the formation of a crown of stiff, narrow, erectly-growing leaves bunched together in a typically rosetted manner. (Plate 117.) A Bunchy Top plant affected in its early stages of growth rarely throws a bunch and when owing to a late infection this does appear it is commonly stunted and possibly malformed owing to the constricted state of the top of the pseudo-stem through which it has to pass.

#### Cause.

It has now been demonstrated conclusively that Bunchy Top belongs to that type of plant malady known as a virus disease. The various plant diseases included in this type show many general points of similarity, of which the chief lies in the fact that the casual agents are of such minute size that they have so far defied all attempts to view them microscopically. What little is known regarding the nature of the infectious agent or virus concerned in the different virus diseases has been determined by experimenting with the plant juice in which it is known to be present. A virus disease may be transmitted from one plant to another in various ways. For some it is merely necessary to inoculate a healthy plant with the expressed juice from a diseased individual. In other cases grafting of diseased on to healthy tissue becomes necessary. In the more specialised forms the virus is conveyed from plant to plant by means of an insect vector. Bunchy Top belongs to the latter type.

This disease is disseminated by means of the dark banana aphid (*Pentalonia nigronervosa*) which, in pursuance of its normal feeding habits, may first suck the juice of a diseased plant and then migrate and carry out the same process on a healthy one, with the result that the latter becomes inoculated with the virus and so contracts the disease. (Plate 118.) This insect is responsible for the spread of Bunchy Top throughout a plantation and between neighbouring plantations. When one plant contracts the disease the other members of the stool usually become infected as a result of the virus making its way through the connections which link up the various individual corms. Suckers arising from an affected plant almost invariably exhibit symptoms of primary infection from the parent.

### Control.

When considering methods for the control of Bunchy Top it is necessary to stress the following points:—

(1) Bunchy Top is a disease of a systemic nature. The causal virus being present within the living tissue of the host cannot be destroyed by any chemical or mechanical treatment known at the present time, other than by destruction of the plant itself. In other words, a plant cannot be cured once it has contracted the disease.

(2) Bunchy Top may be introduced into a clean area by means of suckers infected with the virus which have been taken from a diseased plantation, and also, if centres of infection are not too far distant, by the possible influx of infected aphids.

(3) The disease is spread within an affected area and also the limits of that area gradually extended by (a) the planting of infected suckers; (b) the transmission of the virus from diseased to healthy plants by the banana aphid.

(4) An attempt to eliminate Bunchy Top by complete control of the aphid is beset by so many practical difficulties in the average banana plantation that the method cannot be entertained.

Therefore, since it has not been found possible to either cure a diseased plant or eliminate the means of transmission of the virus, it is necessary to concentrate on a programme of *eradication* whereby all sources of the infectious agent are completely eliminated by destruction of all diseased plants. With this object in view proclamations have been made which prohibit (1) The transfer of any suckers whatsoever from infected districts into those areas still free from the disease. (2) The removal of suckers from any plantation within an affected area unless the plantation in question has been inspected and found free from the disease.

If this proclamation is adhered to conscientiously by all banana-growers—the very existence of the banana industry in Queensland depends on this—then the following objects will be obtained:—(1) Clean isolated areas will tend to remain clean; (2) spread within affected areas will be greatly reduced.

Growers must not think that these regulations alone are going to eliminate Bunchy Top. It should hardly be necessary to stress the point that, owing to the rapidity with which Bunchy Top may spread, all growers within an affected area must consider their position as serious. If they do not wish their plantations to follow the fate of those in the Tweed area the following recommendations must be adhered to:—

(1) Set aside a definite time in every week in which to carry out inspection of the plantation for signs of Bunchy Top invasion. Each plant should be separately examined and special attention should be paid to the youngest leaf on each plant in order that the earliest signs of infection may be detected. The area of the plantation should be reduced if necessary to a size which will enable careful examination of this nature to be carried out. Special care should be taken during the warmer months when the aphids are most numerous and active.

(2) If any plant should be found to be infected, the whole stool must be dealt with as follows:—First spray the stool thoroughly with Black Leaf 40 to kill all aphids present. Particular attention should

be paid to the crevices round leaf bases, &c. Black Leaf 40 should be used at the rate of a dessertspoonful to a gallon of water, to which soft soap has previously been added until a good lather is obtained. After spraying, dig out the whole stool and cut the plant up into small pieces which will quickly dry out. It must always be borne in mind that it is not sufficient to treat only the individual plant affected, as the virus may have already passed to other members of the stool, although its presence there is not yet apparent.

(3) All growers should co-operate in seeing that all diseased plants are eradicated from their district, as it is only by achieving this object that the industry can be expected to again reach a stable basis in the affected areas.

### LEAF SPOT.

Although some of the oldest growers consider that Banana Leaf Spot has been present in Queensland for the last half-dozen years, it is only recently that the disease has occurred in epidemics of a sufficiently serious nature to cause the grave concern shown in some districts. Leaf Spot is now widely spread and occurs from northern New South Wales in the south to Cairns in the north, including practically the whole of the area in which banana-growing is practised.

### Symptoms.

The first indication that a leaf has become infected is the appearance of indistinct linear markings of a light brownish-green colour. These areas are  $\frac{1}{8}$  to  $\frac{3}{8}$  inch in length and lie parallel to the direction of the veins, two to four of which may be included in their width. These initial spots increase somewhat in width and length and dry out slightly, becoming dark muddy brown to black, linear, linear oblong, or elliptic areas of  $\frac{1}{4}$  to  $\frac{1}{2}$  an inch in length and about one-third or less of this in width. (Plate 119.) On the lower leaves of young plants the spots are larger and broader and show as dark-brown oval to almost circular areas up to  $\frac{1}{2}$  an inch in diameter. (Plate 119 B.) The spots early become surrounded by a diffuse light-green halo, which soon turns a dark yellow and extends its area into the surrounding leaf surface, more especially towards the margin. The central portion of the dark spot representing the region first to be invaded usually dries out to form a lighter grey area, which is often speckled with the black fruiting bodies of the fungus causing the disease. These grey linear or elliptical areas, bordered with black and surrounded with a yellow halo, are characteristic of the disease. Usually the grey spots can be easily distinguished even after the leaf has completely withered. (Plate 119 C.)

The part of the leaf exhibiting yellow discoloration gradually turns brown and dries out. When the spots are sufficiently numerous several lesions may coalesce so that there is formed large peninsulas of dead and dying tissue extending from the margin in towards the midrib and including further spots as these extend. Finally the whole leaf will shrivel.

. In a bad attack the spotting will pass from the lower leaves in succession up the plant until all the leaves are left dead and hanging drooped round the rotting pseudostem. The quality of the fruit is reduced by the loss of leaves. When defoliation is severe the bunch will vary in its development according to the stage of maturity at which the loss of leaves occurred. If this should take place before the



PLATE 117.—A BANANA PLANT EXHIBITING TYPICAL SYMPTOMS OF BUNCHY TOP.

fruit have filled out, the bunch will frequently fail to mature sufficiently to be fit for market. This is specially the case with bunches which normally would be cut during the winter and early spring months.

#### **Cause.**

Banana Leaf Spot is caused by a fungus belonging to the genus *Cercospora*. The spores of this fungus are narrow elongate, many septate structures formed on the ends of dusky brown upright fungal stalks or hyphæ which project in clusters from the surface of the brown or grey areas mentioned above.

Spore formation may commence soon after the lesion has assumed the dark brown stage, but the presence of the spore clusters is not easily detected until the central spore-bearing region dries out, when they give rise to a speckled appearance over the lighter area so formed. Spores may be found on both sides of the leaf, but as a rule by far the greatest number are produced on the upper surface. From the diseased areas they are scattered by wind and rain to healthy leaves, where, if weather conditions are suitable, they germinate and produce further spotting. On an individual plant the leaves become infected in the order of their maturity from the oldest upwards, and in many cases there is definite indication of infection from a spotted leaf below.

#### **Varietal Susceptibility.**

The Sugar and Lady's Finger varieties appear to be somewhat less affected by this disease than the Cavendish, possibly in part owing to their more open habit of growth.

#### **Seasonal Nature of the Disease.**

Leaf Spot is of purely seasonal occurrence. The first noticeable appearance is usually about the beginning of March, and from then on the disease becomes increasingly prevalent until the end of winter. With the advent of spring-growing conditions, the disease quickly disappears, the new leaves coming away free from infection. It is usually possible to find some lesions throughout the year, but during the early summer months these are not abundant except associated with old trash. Preliminary experiments with the *Cercospora* responsible for Leaf Spot have indicated that both vegetative growth and spore development are retarded by temperatures above 80 deg. Fahr. The fact that during the summer months in Queensland the temperature commonly ranges above this point may explain to a certain extent the absence of Leaf Spot during this period. However, the marked slackening in growth of the banana plant as well as other conditions mentioned below are considered to largely contribute to the severity of outbreaks during the cooler months.

#### **Contributing Conditions.**

It has not been possible so far to accumulate data regarding the direct relationship between weather conditions and the severity of Leaf Spot occurrence. Mr. S. E. Stephens, Inspector, Diseases in Plants, has recorded for the Innisfail district a marked increase in the disease following cold snaps. An abnormally wet rainy season in January and February appears to allow an earlier development of the disease. Possibly the root rot, which in many cases accompanies these conditions, contributes

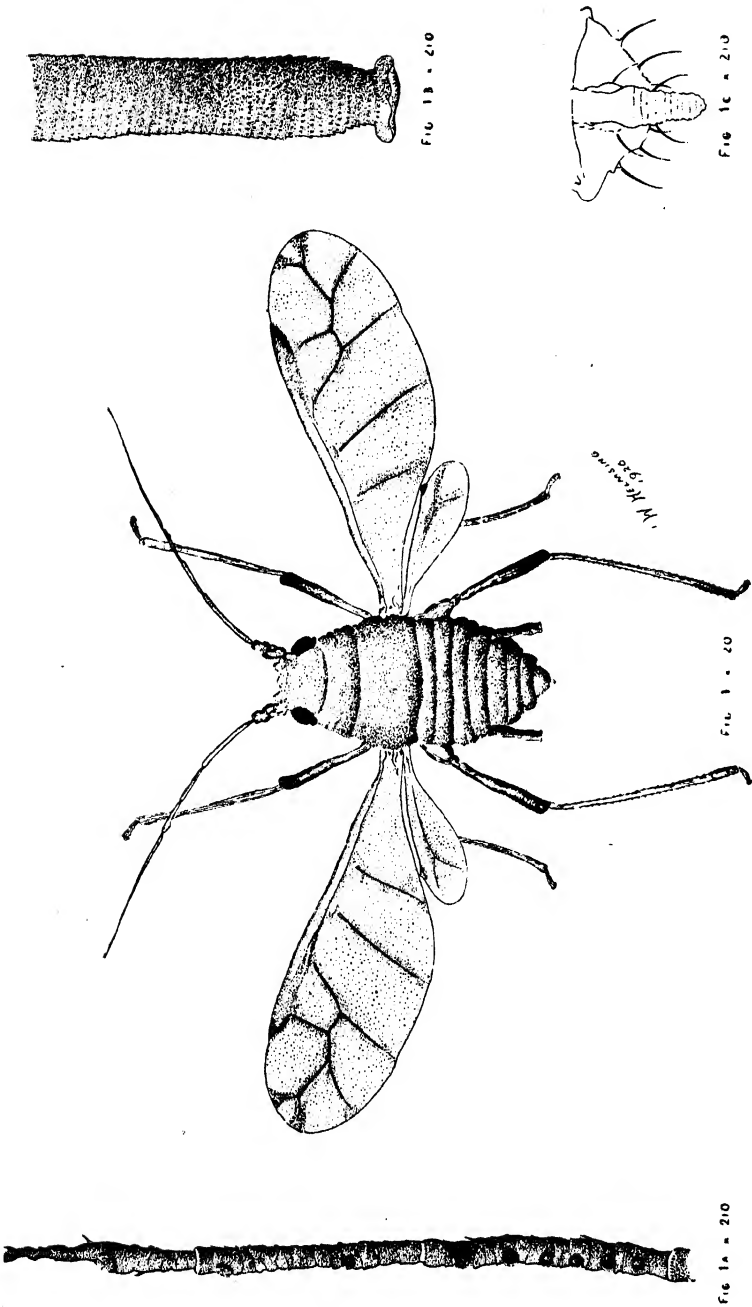


PLATE 118.—THE BANANA APHIS (*Pentalonia nigronervosa* Coq.), THE CARRIER OF THE BUNCHY TOP VIRUS.  
Fig. 1. Winged adult x 20. Fig. 1A. Cornicle of adult x 210. Fig. 1B. Cornicle of adult x 210. Fig. 1C. Anal segment of adult x 210. Fig. 1D. Anal segment of adult x 210.

to the severity of the attack by weakening the plant. Large plants growing under ideal conditions of soil and location may not be affected to the serious extent displayed by those in poorer badly-drained plantations.

Severe individual attacks of Leaf Spot are frequently associated with the presence of beetle borer, and it is possible that the increase in severity of the disease as a plantation ages is in some measure due to the increase of the insect pest.

Apparently a state of lowered vitality brought about by cool weather or other causes is conducive to severe attack. During periods of rapid growth new leaf development keeps pace with the spread of the disease. Infection of all the foliage seldom takes place before the plant has bunched and leaf production ceased. Even then the abundant spotting leading to complete defoliation seldom occurs until the fruit is approaching maturity and no doubt making use of all available food energy.

### Control.

Although Leaf Spot has probably been in Queensland for the last half-dozen years, if not longer, the disease has only recently assumed epidemic form of sufficiently serious nature to attract attention. It is, therefore, not possible at the present time to recommend any certain means of control. Spraying or dusting with a fungicide, which might be advocated for this type of disease, becomes unsatisfactory from the practical standpoint when dealing with a plant such as the banana. However, an experiment to test the efficacy of dusting was carried out during the past epidemic through the much appreciated co-operation of one grower, but the results in this case were not such as would justify the advocacy of this method of control. The value of systematic stripping as a means of reducing the severity of an attack is also being tested out on several plantations. The results from this experiment will not be available until next year.

The following suggestions for the control of Leaf Spot are provisionally submitted:—

(1) Care should be exercised when selecting a site for a plantation to see that the aspect, soil, and other conditions are those best suited to the vigorous growth of the bananas throughout the year. Good cultivation, and, if possible, manuring should also be practised with the same object in view.

(2) Suckers should be planted as far apart as is economically possible in order to reduce the damp conditions arising in a plantation and lessen the rapid spread of the disease from plant to plant.

(3) The disease appears always to start on the lower leaves. The spores produced on these in enormous numbers are blown or splashed on to healthy ones above, and there germinate and produce further centres of infection. By carefully removing, by means of a series of frequent inspections throughout the year, all leaves or portions of leaf showing the spots, it should be possible to so reduce the amount of infectious spore material present in the plantation as to make it possible to tide the plants over their susceptible period without extensive damage being effected. The leaves on removal should be burnt or buried below risk of disturbance. The leaves should be removed when the spots are in the light-brown stage, as spore formation may commence soon after they have darkened and the dispersal of these may nullify the results desired. Special attention would have to be paid to these sanitary



A.



B.



C.

PLATE 119.—BANANA LEAF SPOT.

A, Spots as they appear on the first formed leaves. B, Leaf tissue commencing to die as a result of Leaf Spot attack. C, Spots showing up conspicuously on dry leaf killed by the disease.

measures during the first half of the year when the fungus is on the increase, and the grower might well allocate certain days, at not longer than fortnightly intervals, on which the inspection and destruction would take place. Needless to say, plantations which are heavily infested with Leaf Spot will not show immediate benefit from this treatment. The fact that the amount of Leaf Spot appearing in a new plantation is slight and increases only as the stools age and more spore-bearing material accumulates, would indicate that this method of control is well worth a thorough trial.

Leaf Spot usually first appears in a new plantation as more or less isolated spots on the lower leaf or two of the young plants. Probably these are derived in many cases from spores introduced with the suckers on to which they had fallen in the old plantation. Careful attention given to the removal of these first affected leaves, as soon as the spots appear, may be of special help in reducing the rate of subsequent spread of the disease.

### PANAMA.

This disease affects only the tall-growing varieties of banana, including the Lady's Finger, Sugar, and Gros Michel. The Cavendish or dwarf banana appears to be completely resistant under Queensland conditions, and since this is the common commercial variety grown in Queensland, Panama disease has not so far become the serious menace in this State that it has in other banana-growing countries where the Gros Michel is the standard. Very considerable loss has been sustained, however, by those cultivating susceptible varieties, more especially since few of these growers realise that they are dealing with a specific disease, so that methods of exclusion and eradication are seldom practised.

### Symptoms.

The first signs of an attack of Panama appear on the lower leaves of the plant. The leaf blade commences to turn a deep yellow colour round the margin and along the edges of any shredded segments. As the yellowing advances inwards the portion first affected turns brown and dries out. After this has progressed to a certain extent, the leaf-stalk collapses near its junction with the sheathing base, and the dying leaf hangs down round the pseudo-stem. The leaves are progressively affected in this manner from the base up, and finally the pseudo-stem may appear devoid of all green leaves with the dry shredded remains of these hanging round it. Frequently the outer sheathing bases of the leaves will split upwards longitudinally.

If the plant is infected in the early stages of its growth a bunch may not be thrown or, if one is produced, this will be stunted and the fruit will not mature properly. Plants less seriously affected will often throw a marketable bunch, but one inferior to that which would have been produced by the plant in a healthy state. This latter state may occur in the case of the Lady's Finger variety, which appears to be somewhat more resistant to the attack of Panama.

The best diagnostic characters of Panama disease are internal. If the butt of an affected plant be dug up and split lengthwise, the base of the corm will be found to be discoloured by numerous reddish-brown to black lines running in all directions through the white tissue, and sometimes so numerous as to cause almost complete blackening of the central region of the corm. These lines represent the vascular strands composed of large water-conducting cells which are here rendered conspicuous by the discoloration brought about by the presence of the

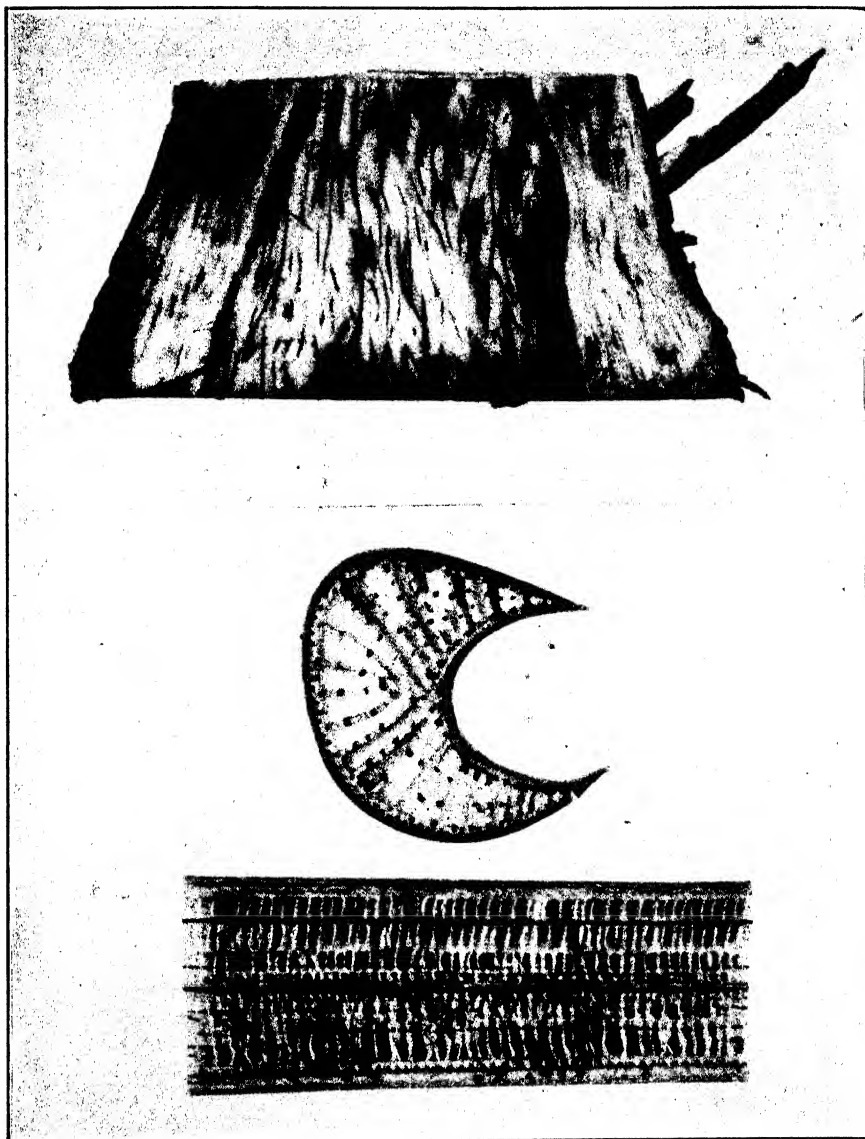


PLATE 120.—PANAMA DISEASE.

*Above.*—Longitudinal Section of affected corm, exhibiting characteristic blackening of the vascular strands.

*Below.*—Transverse and longitudinal sections of a leaf stalk, showing the continuance of the discoloured strands into this region.

fungus or its toxic secretions within them. The brown vessels can be followed up through the corm into the sheathing leaf bases, and from there will often be found extending almost to the ends of the midrib of the leaf. (Plate 120.) A quick diagnosis for Panama can often be made by slitting up the base of the stalk of a withered leaf, near its junction with the pseudo-stem, when these affected vessels may be observed as one or more light yellowish-brown, brown, or reddish-brown lines running up the vertical partitions of the stalk.

### Cause.

Panama disease in Queensland would appear to be caused by the same fungus (*Fusarium cubense*), as is responsible for the disease in Central America. The fruiting bodies of this fungus are produced on both upper and lower surfaces of the leaf and leaf-stalk. They take the form of minute clusters of branched fungus threads which project through the epidermis and bear numerous small sickle-shaped spores. The spores are washed away by the rain and blown by the wind, and if in the process they reach a suitable situation, they may germinate and infect a healthy plant.

The spores are capable of developing and growing for a certain time in the soil. Infection may take place through young tender roots or through wounds in the corm. Once within the plant the fungus grows up through the vessels, producing the symptoms noted above. Infection of young plants frequently takes place by the fungus present in an old parent corm growing out through the tissue connecting it to the surrounding suckers, and in these setting up the same diseased conditions as obtained in the parent. The planting of such infected suckers is one of the chief means of distributing the disease.

### Control.

The only satisfactory way of dealing with Panama disease is by a combination of exclusion and eradication.

(1) Only land which has not previously grown bananas, or land on which Panama disease has never been known to exist, should be planted with susceptible varieties. This precaution is necessary since the fungus may remain for a number of years in the soil even after affected plants have been removed.

(2) Special care should be taken that suckers are obtained only from a district in which Panama disease is definitely known not to exist. Suckers obtained from within an infested area are always liable to be infected, and signs of this might escape detection by the grower.

(3) In spite of these precautions a plantation may become infected by means of wind-borne spores or by infectious material accidentally introduced on boots, &c. A careful watch should therefore be kept for the appearance of the disease, and if a plant is observed showing symptoms of Panama, the whole stool should immediately be dug out and the affected plant, together with any invaded suckers, should then be removed carefully so as to avoid spreading spores about, chopped into pieces and burnt. Any instrument used in cutting a diseased plant must be disinfected by washing in a fungicidal solution, or by passing through a flame, before it is again used on a healthy banana. It is important for this eradication process that diseased plants are detected and removed in the early stages of the disease before spore formation has commenced. It is very unwise to replant in the spot from which a stool has had to be removed.

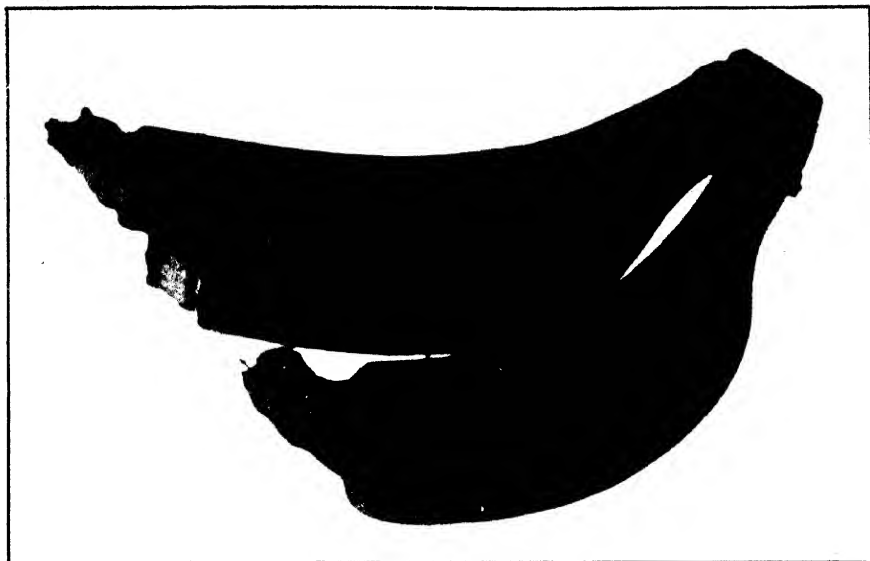


PLATE 121.—CIGAR END.

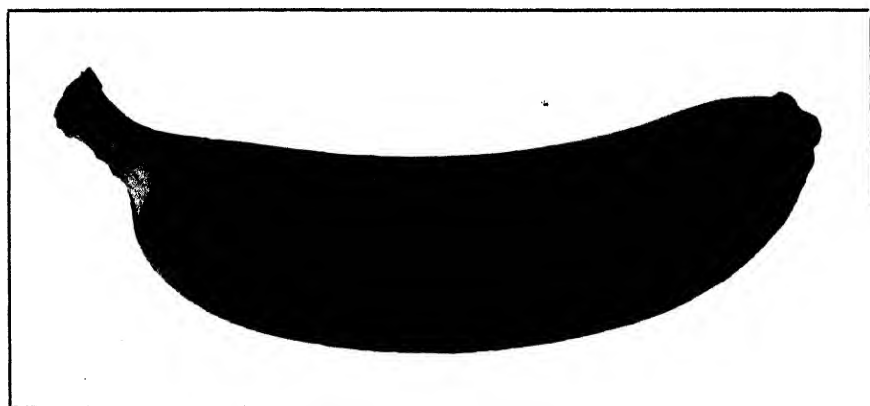


PLATE 122 —STEM END RCT.

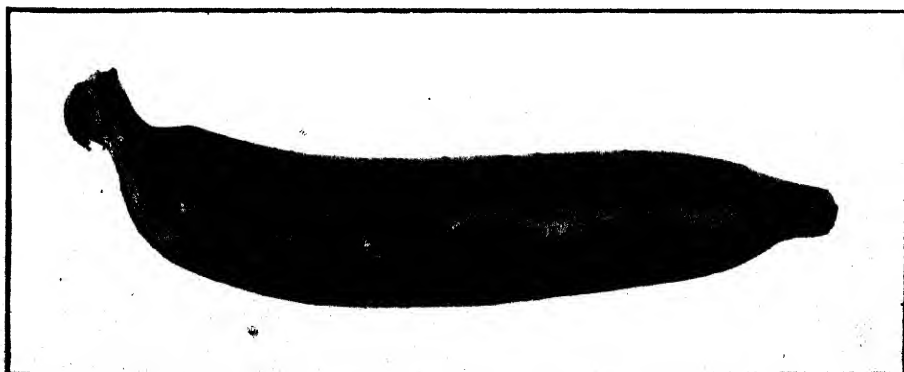


PLATE 123—'ANTHRACNOSE.

## DRY ROT.

Dry Rot is not a disease of serious consequence owing to the fact that it is only an isolated plant or a small group of plants that is usually affected. However, in the absence of knowledge regarding the disease, its appearance sometimes causes concern.

### Symptoms.

An individual plant or stool may exhibit a cessation of vigorous growth and later the leaves commence to die back from the margins. Finally the whole plant dies back and turns brown and dry.

It will be found that the plant so affected may be easily pushed over as it is practically devoid of sound roots. On cutting open the corm a portion or the whole of the interior is seen to have been changed to a substance of a more or less dry, "punky" nature of a dirty white to brown colour. This consists of a mass of closely interwoven fungal threads which have invaded the corm and largely replaced the plant tissue.

### Cause.

Dry Rot may be caused by several fungi, including a *Poria*, belonging to the Basidiomycetes or higher fungi. These fungi live for the most part on dead and rotting stumps such as are usually present in abundance in the average banana plantation. From here certain of them are able to pass to a living banana plant, should such be growing in close proximity, and, by invasion of the corm, produce the Dry Rot described above. Growers have noticed that the stumps of certain species of trees are more commonly associated with these dry-rot-producing fungi.

### Control.

Often Dry Rot does not spread beyond the original stool attacked, but on some occasions the fungus gradually extends its area of attack to adjacent stools. For this reason it is advisable when a plant is observed to be affected to locate, if possible, the stump or root from which infection has proceeded and remove and burn this together with the affected corm.

## FRUIT ROTS.

### A. Stem End Rot.

This disease is sometimes known as Black End owing to the fact that affected fruit exhibit a black area of soft rot round the stem end.

### Symptoms.

The trouble usually commences as a dark water-soaked area formed in connection with a bruise or other injury to the short fruit stalk or working in from its broken end. (Plate 122.) As the rot progresses the stalk turns completely black and becomes much shrunk and sometimes shredded. From the stalk the soft blackened area extends through the skin of the fruit at a more or less rapid rate, the pulp beneath turning soft and watery.

Stem End Rot is not a disease of the plantation as it usually appears only when the fruit are approaching maturity, especially after long distance consignment.

### Cause.

Associated with this rot are usually to be found fungi of the genera *Verticillium*, *Gloeosporium*, and *Fusarium*. It would appear that under suitable conditions any weak wound parasite of this type would be capable of producing similar injury. Careful examination of affected fruit will reveal the fact that the primary cause of the trouble lies in injuries given to the fruit during the frequent handling to which it is subject. The injury may be due to bending the fruit stalks while the hand is still on the bunch. The bruise resulting from this is sufficient to constitute a point of entry for the rot-producing fungi without a definite abrasion of the skin. The wounds and bruises arising from tearing apart the fingers from the hand will also serve as infection points. These latter are a common source of trouble in cased fruit.

### Control.

(1) As regards fruit marketed in the bunch it is essential that the bunches receive most careful handling from the time they are cut until they reach the consumer. When one considers the rough treatment the fruit is often subjected to it is remarkable that not more damage results.

(2) In order to lessen Stem End Rot in cased fruit it will be necessary to pack in hands or half-hands rather than in singles. The hands should be carefully cut off round the collar by which they are attached to the central stalk, and if it is necessary to reduce them in size the division should be made by a sharp knife and not by a tearing process.

(3) The grower should avoid accumulating a heap of rotting banana refuse round his packing shed. This material serves as a breeding ground for the various organisms causing Stem End Rot and spores produced here may serve to contaminate fruit during the process of packing. The discarded fruit and stalks could be thrown into a pit and covered every now and then with a layer of soil.

(4) The same need for cleanliness may be stressed with regard to some ripening rooms. The absence of a regular cleansing programme will increase the chance of infection with rot fungi.

## B. ANTHRACNOSE.

Anthracnose is of rare occurrence in the plantation, where it occasionally appears in the form of a leaf and fruit spot. More commonly it is met with as a ripe rot of the fruit on the market.

### Symptoms.

The early stages appear on the skin of a ripening fruit as small muddy brown rather diffuse spots. These enlarge rapidly and take the form of slightly depressed areas, rounded or irregular in shape, and dark brown to almost black in colour. The spots may coalesce until large areas of surface present a black, rotting appearance. When subjected to moist conditions, the older parts of the affected areas become covered with minute pink pustules formed by the spore masses of the causal fungus. (Plate 123.) In the early stages the affected area is restricted to the skin, but soon the pulp below the spot becomes invaded and takes on the water-soaked appearance of a soft rot, which rapidly spreads through the tissue rendering the fruit unfit for consumption.

Anthracnose occasionally appears on the leaves as large elliptical brown areas which may extend to include considerable areas of leaf surface.

**Cause.**

Anthrachnose is caused by a fungus (*Glæosporium musarum*). This organism is only of a weakly parasitic nature and is not usually found attacking fruit except in the later stages of ripening. It may considerably hasten what is commonly termed the over-ripe condition. Bruising of the fruits will contribute to the attack of this fungus.

**Control.**

The control measures for Anthrachnose should follow the same general lines as advocated for Stem End Rot. Attention must be paid to careful handling to avoid bruising and to the practice of cleanliness at the packing shed, market and ripening room.

**C. CIGAR END.**

In contrast to the two previously mentioned fruit troubles, cigar end is a disease to which the fruit become subject in their more immature stages. Commonly only a few of the fingers on a bunch exhibit the symptoms, but records have been received in which the whole bunch has been affected.

**Symptoms.**

Affected fruit exhibit a firm black rot at the apex. The extent of the decay varies from a scarcely noticeable ring of black tissue round the terminal crown to a regular extension back for half an inch or more. The affected portion shrinks, in many cases becoming more or less rounded in contrast to the angular shape of the immature fruit. (Plate 121.) The blackened tissue then becomes covered from the distal end back with an ashy grey or sometimes pinkish grey coat of fungal spores, which give, in typical cases, the striking resemblance to a burnt cigar tip to which the disease owes its name. The old shrivalled floral organs often persist for considerably longer than the normal period on affected fruit.

**Cause.**

A fungus (*Verticillium sp.*) is almost universally associated with cigar end, and it is the conidiospores and spores of this organism closely studded over the affected region which gives rise to the grey covering characteristic of the disease. A consideration of the early stages of attack would suggest that infection may possibly take place through the tender floral structures which appear particularly susceptible to fungus invasion.

**Control.**

Definite recommendations based on a full investigation cannot be made at present. It is suggested that the young bunch be opened up to the light and air and the bracts which sometimes tend to remain attached to the developing hand, especially during wet weather, be removed as soon as possible.

**D. SQUIRTER.**

Squinter is a trouble of a somewhat obscure nature which shows up mainly in connection with fruit which has undergone long distance consignment to Southern States. After ripening, the centre of the fruit will be found to have turned to a soft, watery mass, which will squirt out when pressed. The symptoms would suggest that Squinter may be connected with physiological disturbances arising out of the present ripening and transport methods. The true nature and cause of Squinter is at present under investigation.

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## LEAF SPOT OF BANANA IN SOUTHERN QUEENSLAND.

Dr. B. T. DICKSON, Chief, Division of Economic Botany, Council for Scientific and Industrial Research.

AS soon as any plant is grown intensively and extensively as a crop, it becomes liable to suffer from diseases which more or less affect the vitality of the plant and reduce the yield, and to this generalisation the banana is no exception. Some diseases require the interaction of an insect carrier which transmits a highly infectious "virus" from plant to plant, and even the best tended plantations may be devastated by such a disease as the now well-known "bunchy top." In other cases general conditions of hygiene in the plantation, combined with unfavourable climatic environment for the time being, bring into prominence a disease which may in other seasons not be a serious factor. It is to this latter group that the disease at present under consideration apparently belongs.

As a result of the perturbation among banana growers in Southern Queensland occasioned by the prevalence of Leaf Spot, the Hon. W. Forgan Smith, Secretary for Agriculture and Stock in the Ministry of the Government of Queensland, requested the Commonwealth Council for Scientific and Industrial Research to enable the writer to undertake a survey of the situation. In the course of this investigation the following places were visited:—

22nd, 23rd, 24th June: Gympie, Scrubby Creek, Goomboorian, Cedar Pocket.  
25th, 26th June: Cooran, Kinkin, Pinbarren, Traveston.  
27th June: Eumundi, Belli, Manni road.  
28th June: Landsborough, Bald Knob, Mount Mellum.  
1st July: Montville.  
2nd July: Ormeau.  
3rd July: Southport.

### Findings.

In every plantation except at Southport (where the bananas were surrounded by salt water) Leaf Spot was prevalent. In most cases it was causing serious loss, and it will have definitely reduced the yield of bananas by the end of the winter season. It was quite common to find plantations where but few of the bunches now formed will fill out and mature because of the complete dying of the foliage. Furthermore, the disease is manifesting itself in young non-bearing plantations, and this naturally causes serious worry among the growers as to the fate of future crops.

During the tour the weather was unpleasantly wet and cold, but it served to show that many of the plantations are on ill-drained and unsuitable soil even though on a steepish slope. Such plants were found to have an extremely poor root system, almost all the roots being brown and rotten. Again, borer was too prevalent, and but little attempt was made in many cases to check its spread. Some growers who had taken precautions to check borer, as recommended by the Department of Agriculture, were satisfied that, although it was not a complete check, it was worth while. Unfortunately, part of the industry is "nomadic," in that after three years a plantation is forsaken and another started. The old plantations must undoubtedly become a great breeding-ground for borer and fungi, from which newer neighbouring plantations may automatically become affected.

Another striking feature was the fact that cold weakened the foliage in some plantations and here Leaf Spot was making rapid headway.

The point in noting the above-mentioned facts is that I feel this season's condition to be the culmination of a series of troubles. The organism causing Leaf Spot is possibly seasonal and not likely to be a very strong parasite. Given poor root systems, borer at work, soil not suitable, cold and wet weather, and there is a combination to suit the fungus which has gradually been gaining momentum in the plantations. Debilitated plants succumb under such a combined attack as one would expect. It is interesting to note that the youngest leaves are not usually seriously affected, even when older leaves are hanging dead, until the bunch begins to mature, and they then become spotted from the tip back until they in turn die.

### Characteristics of the Disease.

As the name indicates the chief symptom of the disease is the spotting of the leaves. The lower leaves are affected first, the number of spots appearing depending on the conditions for infection in the plantation. If there is an abundance of

diseased foliage and rains are frequent there is also an abundance of infection, and it appears as if the disease gradually gets up a momentum so that there is a serious increase in its severity.

The middles of the rather oval spots die and become somewhat ashy brown in colour, and later a fungus develops its spore-bearing bodies in that dead tissue. From these small black fungal bodies many thousands of spores are spread during continued wet or muggy weather.

Gradually the spot invasion reaches the upper leaves, those below being now dead and hanging down against the stem. It was a common sight to see a plant with but three living leaves left at the growing point, and when the bunch is attempting to mature fruit it needs all the foliage possible since it draws upon the leaves for its starch. In some cases the bunch was developing sufficiently fast and was already near enough shipping maturity that it would just scrape through, but much more frequently it was just reaching that stage of maturity when the demand on the few remaining leaves was heaviest. At this time they also became infected with Leaf Spot and rapidly succumbed so that the bunch could not mature.

A disease such as this occurring in banana plantations on hillside slopes is not easy to control by spraying or dusting for obvious reasons, and until a thorough study is made none but general recommendations can be suggested. It does appear, however, that the general cleanliness of the plantation, the state of culture, and consequent health of the plants is important. It is worth while therefore for growers to consider cleaning up abandoned plantations, keeping down diseased trash in present plantations, and obtaining clean suckers for future plantings. The provision of a windbreak between plantations might also protect a clean area.

### **Suggested Investigations.**

It must be clear to a thinking grower that some time to study the disease and its attendant conditions must elapse before any definite remedial measures can be proposed.

In view of the above facts and others not given in so general an account, the following points are noted as some of the phases requiring investigation:—

1. Study of the organism causing Leaf Spot to determine its identity, temperature and humidity relations, method and conditions for infecting the leaf, conditions of spore development, longevity of the organism in dead leaves and of the spores when free (wind blown, &c.)

2. Effect of leaf age on infection. Effect of root injury, due to water-logging, or excessive drying; or fungal attack and infection by borer, and the susceptibility of the plant to infection. Effect of cold and of malnutrition from poor soil and the susceptibility of the plant to infection.

3. Amount of spot in summer as compared with winter. First occurrence in autumn and winter. Relation of occurrence to dew or rainfall or generally cloudy conditions.

4. Control measures, such as dusting with copper-lime dust, trimming affected leaves as soon as possible in season (trashing), liming soil, draining water-logged areas, cultural practice modification (chipping, cover crops, &c.), baiting for borer.

5. Relation of "freckle" to leaf death and its possible inter-relation with Leaf Spot.

6. Comparison with possibly similar diseases occurring elsewhere than in Australia.

### **Recommendations.**

As noted above it is obvious that some time must elapse before the full story of the Leaf Spot disease can be set down. A start has already been made by Mr. Simmonds, of the Department of Agriculture. Full time work on diseases of banana and pineapple is quite justified by the economic importance of the industry in Queensland.

The suggestion is made, therefore, that Mr. Simmonds be freed from other duties to concentrate on banana and pineapple diseases. I feel that, given the opportunity and the facilities, he already is sufficiently aware of the problem to make good headway. In so far as my other duties permit it will give me pleasure

to afford such help to Mr. Simmonds as he may from time to time require. I trust also that the growers will back up any investigation with wholehearted co-operation. There is definite evidence of interest on the part of many of them which is most encouraging.

### Acknowledgments.

It affords me great pleasure to express my appreciation of the facilities afforded me and of the many personal kindnesses shown during the survey. To Hon. W. Forgan Smith and Mr. Graham for departmental hospitality and help, and to Mr. Veitch and Mr. Simmonds for personal company and field knowledge freely placed at my disposal, to Mr. Ranger and Mr. Ellison for detailing the trip so that the Committee of Direction officers were available in each district, to those officers for their excellent arrangements in spite of inclement weather, and to the growers who were good enough to attend in considerable numbers in spite of work and weather, my thanks are due.

## RAINFALL IN THE AGRICULTURAL DISTRICTS.

TABLE SHOWING THE AVERAGE RAINFALL FOR THE MONTH OF SEPTEMBER, IN THE AGRICULTURAL DISTRICTS, TOGETHER WITH TOTAL RAINFALLS DURING SEPTEMBER, 1928 AND 1927, FOR COMPARISON.

Divisions and Stations.	AVERAGE RAINFALL.		TOTAL RAINFALL.		Divisions and Stations.	AVERAGE RAINFALL.		TOTAL RAINFALL.	
	Sept.	No. of Years' Records.	Sept., 1928.	Sept., 1927.		Sept.	No. of Years' Records.	Sept., 1928.	Sept., 1927.
<i>North Coast.</i>					<i>South Coast—continued:</i>				
	In.		In.	In.		In.		In.	In.
Atherton ...	0.70	27	0	0.28	Nambour ...	2.70	32	0.42	6.97
Cairns ...	1.75	46	0.10	1.45	Nanango ...	1.90	46	0.09	0.54
Cardwell ...	1.60	56	0	1.37	Rockhampton ...	1.40	41	0	1.39
Cooktown ...	0.60	52	15	0.43	Woodford ...	2.29	41	0.60	5.20
Herberton ...	0.51	41	0	0.17					
Ingham ...	1.59	33	0	2.52	<i>Darling Downs.</i>				
Innisfail ...	3.72	47	0.02	1.70	Dalby ...	1.75	58	0.15	0.37
Mossman ...	1.64	15	0.11	1.14	Emu Vale ...	1.84	32	0	0.29
Townsville ...	0.87	57	0	1.07	Jimbour ...	1.58	40	0.02	0.68
					Miles ...	1.44	43	0.03	0.25
<i>Central Coast.</i>					Stanthorpe ...	2.37	55	0.36	0.51
Ayr ...	1.55	41	0	0.95	Toowoomba ...	2.22	56	0.26	1.49
Bowen ...	0.87	57	0	0.97	Warwick ...	1.86	63	0.02	0.61
Charters Towers ...	0.80	46	0	1.02					
Mackay ...	1.67	57	0	1.42	<i>Maranoa.</i>				
Proserpine ...	2.35	25	0	2.42	Roma ...	1.52	54	0	0.56
St. Lawrence ...	1.31	57	0	1.12					
<i>South Coast.</i>					<i>State Farms, &amp;c.</i>				
Biggenden ...	1.64	29	0.29	1.47	Bungeworgorai ...	1.17	14	0	0.03
Bundaberg ...	1.71	45	0.15	1.00	Gatton College ...	1.65	29	0.14	1.27
Brisbane ...	2.03	77	0.78	1.77	Gindie ...	1.11	29	0	0
Caboolture ...	1.95	41	0.20	3.15	Hermitage ...	1.61	22	0	0.68
Childers ...	1.90	33	0.57	1.89	Kairi ...	0.72	14	0	0.29
Crohamhurst ...	2.79	35	0.25	6.14	Sugar Experiment Station, Mackay	1.63	31	0	2.17
Esk ...	2.24	41	0.82	1.60	Warren ...	0.89	14	0	1.35
Gayndah ...	1.60	57	0.19	3.13					
Gympie ...	2.17	58	0.24	2.41					
Kilkivan ...	1.76	49	1.21	0.98					
Maryborough ...	1.99	56	0.41	2.09					

NOTE.—The averages have been compiled from official data during the periods indicated; but the totals for September this year, and for the same period of 1927, having been compiled from telegraphic reports, are subject to revision.

GEORGE G. BOND, Divisional Meteorologist.

## Cotton-Growing in Queensland.

*The results obtained in the last six seasons have demonstrated that the Cotton Plant can be successfully cultivated over a large area in Queensland. During this period a variation in seasonal conditions, ranging from drought to flood, has been experienced. In each of the seasons referred to, however, splendid yields have been obtained by farmers in the majority of the main cotton-growing areas. It was only to be expected that at the revival of operations in cotton-growing in this State a number of unprofitable yields should be individually recorded, owing to the inexperience of the growers and the lack of knowledge of the correct methods to be adopted. Decided progress has, however, been made in each successive season, until there are at present many successful cotton-growers in the State.*

*This article is issued at the direction of the Minister for Agriculture and Stock (the Hon. W. Forgan Smith) in order that the primary producers of the State may be made acquainted with some of the factors which have a direct bearing on the yield obtainable from a crop of cotton. In addition to this feature, several phases of the major problems which confront cotton-growers are discussed, and the activities of the Department of Agriculture and Stock in its aim to assist in the solution of these problems are described.*

### INCREASE IN THE AVERAGE YIELD PER ACRE.

#### Problems for the Grower.

There are so many factors entering into the problems of increasing the average yield per acre that it is exceedingly difficult to lay down any "hard and fast" rules for growers to follow. Each has to experiment and determine the value of any particular method when applied to the soil and climatic conditions. The suggestions embodied in this Bulletin have been arrived at as a result of observations made in commercial crops, and in experiments with farmer co-operators, over a wide range of soil and climatic conditions during the past six seasons.

#### Soils.

In the early stages of the present revival of cotton-growing in this State, there was much confusion of thought as to the most suitable soils for the purpose. Realising this point and taking into consideration the inexperience of the growers, the guaranteed advances of the Queensland Government were made sufficiently high to allow of a test of cotton-growing in all classes of soils, and an excellent demonstration of the suitability of the various soils was thus afforded. At the

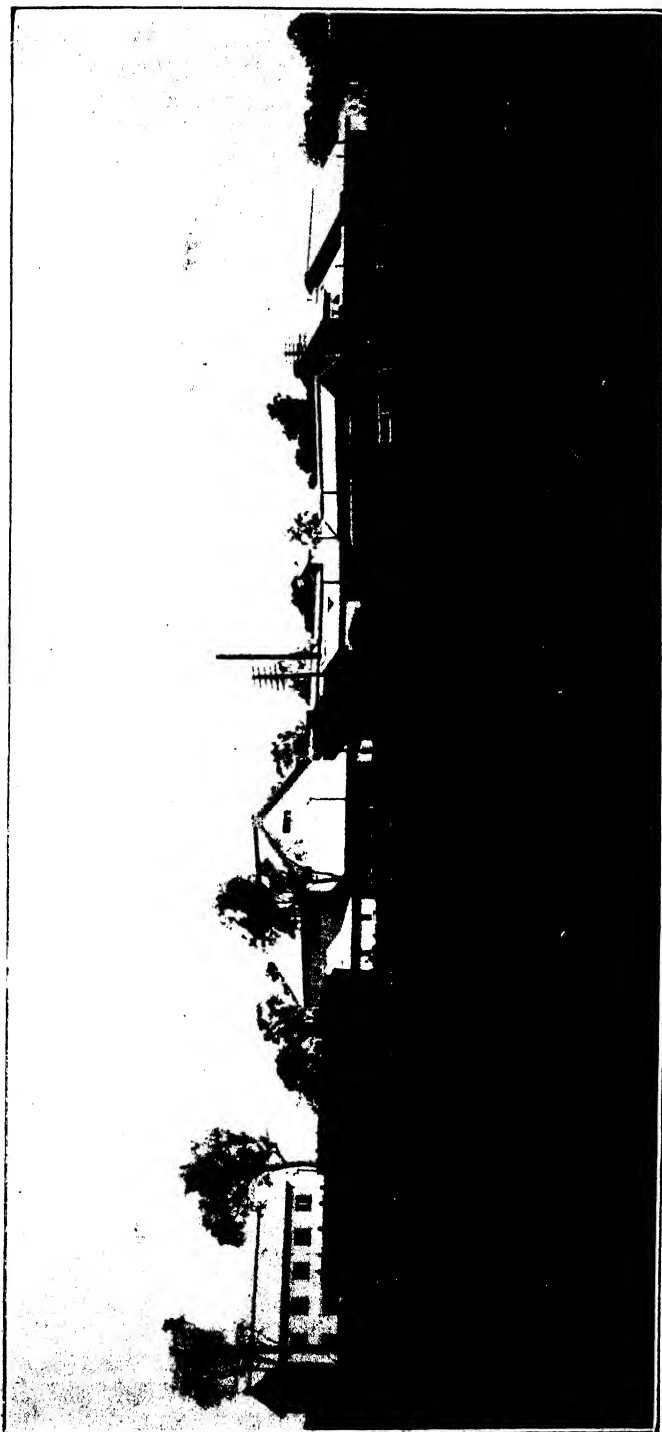


PLATE 124.—COTTON GINNERY AND OIL MILLS, WHINSTANES, NEAR BRISBANE

termination of the system of guaranteed prices, a fairly clear general definition had been obtained of the most suitable districts, and, to some degree, the most suitable and unsuitable soils for cotton-growing.

Broadly speaking, the most suitable soils are those of a loamy nature overlying a clayey subsoil to a depth of 1 to 3 feet. There appears to be a wide range of soils of this type, varying from the sandy and heavy alluvial loams to the heavy loams of the mixed brigalow and soft vine scrubs. Cotton crops grown on such a combination, whilst they seem to have a high degree of productivity under drought conditions, are also able to produce a normally developed plant in a wet season. The explanation appears to be that the clayey subsoils hold the moisture up to the lower lateral root system. In a dry season, the moisture is thus available, whereas in a wet one the tendency to thorough saturation produces what has been described as a "physiological drought effect." Under the latter condition there is so much moisture around the root system that there is a restriction of the amount of available plant-food.

**The quality of the soil is an important factor in successful cotton-growing.**

It is essential in every type of soil that there shall be a proper balance of readily available plant-food. On some very fertile soils of great depth, where this balance is present rank development may occur at the expense of fruiting, when excessive rainfall is experienced. Generally in the case of any peculiar growth, other than that caused by loss of crop through some external agency such as insect attack, &c., the soils can be suspected to be lacking in some of the plant-foods required by the cotton plant or containing insufficient humus. It is suggested that each grower should check the yields of the various portions of his crop and thus determine which portions are non-profitable producers. An analysis of these sections may show either that the fault can be easily corrected or that the remedy which might be suggested to make it a productive area could not be favourably considered from an economic standpoint.

### **Preparation of the Seed-bed.**

The general experience of most of the cotton areas has been that the early preparation of the seed-bed assists in obtaining a good yield. Several factors appear to be involved in this phase of cotton-growing, the chief of which is the effect on plant growth and insect life. Owing to the light rainfall of the usual autumn and winter seasons in the cotton belt it is often difficult to prepare a proper seed-bed. Consequently, if the preparation is delayed until the early spring months, such a short time elapses before the usual planting rains set in that the seed-bed is of an open nature and is generally lacking in moisture in the lower levels. From results obtained on the Callide Cotton Research Station, growers have had it demonstrated to them that, by the preparation of the seed-bed as soon as possible after the old crop has been harvested, a strike may be obtained on the first planting rains which will be maintained over a dry period of some length.

The old crop should be cut off and burned and the land ploughed by the end of July if possible. Not only does this provide a period of from seven to twelve weeks before planting-time for the seed-bed to firm,

but much destruction of any pupæ of injurious pests is accomplished. It is strongly recommended that the bushes be cut off and burned instead of ploughed out or under, as is done in some cases. A modification of the old slide maize-cutter can be constructed to cut the plants at small expense, and a thorough clean-up is easily effected by dragging the cut bushes together by means of harrows.\* This allows of the destruction of large numbers of Stainer insects as well as any pests which may be in the unopened bolls.† The burning of the old plants also allows of the preparation of a firmer seed-bed than is the case where the plants are turned under.

### Planting Seasons.

In every one of the last six seasons the general experience has been that early planting gave profitable results. The explanation appears to be that the seasonal conditions during October and November are conducive to the development of a well-fruited plant, where the sowing has been made in the latter half of September or the first half of October. The night temperatures are then generally low, and ordinarily, only light storms are experienced. The seedlings make a slow growing stocky plant with a good root system under such conditions, and after the summer rains commence in December a splendid fruiting system is developed. Such a structure usually produces a sufficient crop of squares and bolls to control the plant's growth during the wet season in late January and February, unless the soils are exceptionally fertile and very heavy rainfall is recorded. Even in cases where these conditions occur, the early planting of crops tends to prevent excessive growth.

**Sow your cotton seed in late September or early October.**

It appears at present that early planting offers the best and most economical means of escaping serious attacks of the Corn Ear Worm (*Heliothis obsoleta*). In each season excellent yields of cotton have been obtained at the Callide Cotton Research Station from early planted plots, while late planted cotton in close proximity to the early plots has been so seriously attacked that no crop was harvested. It is believed that the controlled growth of the early-sown crops which causes a slow toughened development of the plants, together with the fact that a large amount of squares are being developed when the heaviest broods occur, are responsible for the good yields even when the Corn Ear Worms are known to be present in large numbers. A considerable loss of squares on early-sown plants may result from attacks by this grub, but the heavy rate of setting of squares still permits of the production of a profitable crop of bolls. The reverse conditions generally exist in the late-sown crops where the plants are making a soft sappy growth under the extremely forcing conditions of the hot "wet season" months, and any removal of the light crop of developing squares accelerates the rate of growth without an accompanying increase in the rate of setting of squares. The result is often a tangled mass of rank vegetation with only a light crop of bolls which, in districts where frosts occur, are seldom harvested.

\* A description of this machine was published in the June, 1928, number of the "Queensland Agricultural Journal."

† Detailed descriptions of the various insect pests which attack cotton in Queensland are given in the Bulletin "Cotton Cultivation in Queensland," published by the Department of Agriculture and Stock in 1928.

### **Planting Methods.**

The average cotton-grower does not sow a high enough rate of seed. The rate of sowing advocated by the Department, and which is the one adopted by the Cotton Board in the distribution of the planting seed, is 20 lb. to the acre. It is known, however, that large numbers of the growers only plant at rates varying from 10 to 15 lb. to the acre. This is a mistake, as the seed costs only a penny a lb., and though a small initial saving is made by planting at a lighter rate, a much lower financial return is generally secured owing to the occurrence of gaps in the stands obtained. The argument is often advanced that the lighter sowing facilitates thinning and thereby reduces the cost of that operation. The slight saving which may be effected, provided the thinning is carried out at the proper time, is more than off-set by the loss of stand in the lighter sowings. One has but to endeavour to space an experiment requiring an 18 or 24 in. spacing in a crop sown at the rate of 15 lb. to appreciate the large number of gaps in a field where such a spacing cannot be accurately obtained. It is believed, therefore, that 20 lb. should be the lightest rate used, and where there is danger of the soils crusting if rains fall after planting, an even higher rate may be used to advantage.

### **Thinning.**

The thinning of the crop is often looked upon as a very expensive operation and, in some cases, as unnecessary. The results obtained over most of the cotton areas by growers, and also in experiments, indicate that thinning is a necessary operation. It need not be as expensive as many growers make it, however, if the work is done at the proper time and with the correct implement. The writer has seen many growers using amongst small plants heavy unsharpened chipping eye-hoes with crooked "sapling" handles, with an expenditure of energy that would have removed good-sized weeds. If the proper cultivation has been maintained, the thinning can be performed with a light goose-neck garden hoe. This implement is operated with considerably more accuracy and less effort than is the heavy chipping hoe, with the result that an energetic person can thin up to 3 acres a day.

### **Cultivation.**

Cultivation is one of the most important operations in growing a crop of cotton, and yet it is astonishing that so little study is given to this subject by many of the growers. Four cultivations, at least, should be given to the average cotton crop, and therefore every effort should be made to have each operation efficient. Particular attention should be given to the kind of points required at each cultivation and especially to the set of inner points next to the plants, as it is by the proper use of the cultivator that much hand labour can be eliminated.

There are several types of suitable cotton cultivators now obtainable in Queensland, all of which embody the principle of driver-steered machines rather than the rigid tongue machine which is steered by guiding the horses. Much finer work close to the plants can be performed by the former machines, as in this type the steering is done by the driver operating either the wheels or by a movable foot-steered suspended carriage. These machines can be fitted with various points such as diamond-pointed teeth, 8, 10, and 12 in. sweeps or duck feet, half steels, hillers, and on some machines the carriage for attaching points can be exchanged for one with discs. With such an assortment

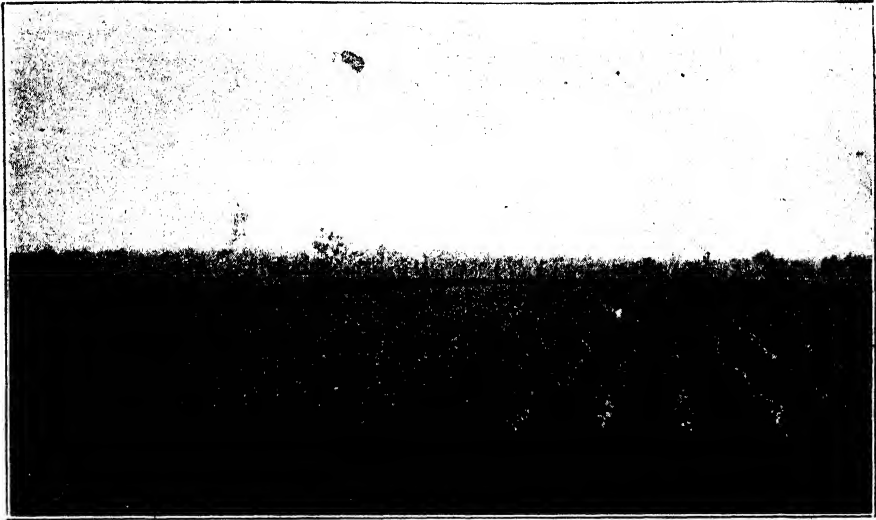


PLATE 125.

Plant long, straight rows and thus improve the efficiency of the cultivating machinery through the class of work performed and by the additional acreage covered per day. Short rows increase the number of turnings per acre with a consequent loss of time. Experiments have failed to demonstrate that there is any advantage obtained by planting the rows according to the compass, therefore plant the long way of the field if the slope of the land allows.



PLATE 126.

Start thinning when the plants are from 4 to 6 inches high and complete the field by the time the plants are from 6 to 8 inches high. The plants in the illustration average 6 inches in height.



PLATE 127.

Illustrating efficient cultivation. The plants in the foreground are velvet bean seedlings, which are very brittle, yet with the equipment being used no damage was done to them. The soil is of a clayey nature and the cultivating is being done three days after a hard rain.

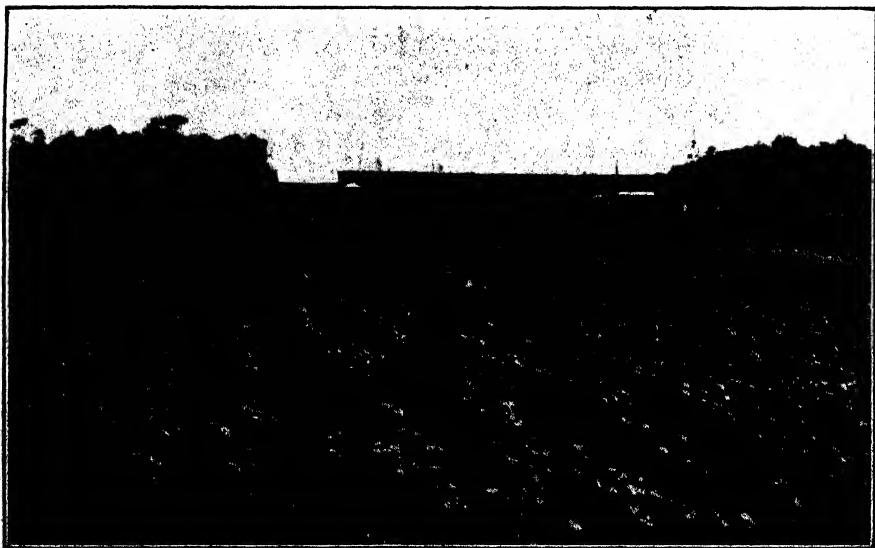


PLATE 128.

Illustrating a well-cultivated field. Note the good stand of plants right up to the end of the rows.

of equipment for the cultivator, a grower can obtain the right combination for each particular operation and thus ensure a maximum of efficiency.

All the factors which have been touched upon contribute to the increase in the yield of seed-cotton per acre, and in several respects to the improvement of the quality of the cotton produced. They are, therefore, of extreme importance, as the increase of the yield per acre offers the most promising means for the reduction of the cost of production, which in conjunction with the improvement in the quality will result in an increased net return to the grower.

### **COST OF PRODUCTION.**

The reduction of the cost of production is the big problem of the Queensland cotton-grower and, while it may be difficult in some instances, it is believed that most of the growers can make substantial improvement in this respect. In the majority of the cotton-growing areas of this State the land values are relatively low to those existing in the districts where other farm crops are grown which would give returns comparable to those obtained from cotton, and the interest on investment in land is thus proportionately less. The amount of machinery required to grow cotton in an economical way, however, totals in the neighbourhood of at least £150, exclusive of the necessary horses. The yearly interest and depreciation on this capital investment therefore amounts to an appreciable amount. Where a farmer is growing only cotton, the whole sum has to be charged against this crop and it is necessary that there should be sufficient acreage under crop to keep the expenditure per acre on a reasonable basis. As one man can cultivate 40 acres of cotton with equipment costing the abovementioned sum, it will be seen that any crop acreage of less than this amount would increase the overhead expense per acre.

**Up-to-date methods of cultivation reduce the cost of production and increase the acreage yield.**

In most of the main cotton-growing areas where large blocks of suitable land may be obtained, one man, with the help of extra labour at thinning time, can take care of 40 acres if he farms properly. In farming properly, he will need to pay attention to the various factors which have been pointed out as bearing on the yield per acre. As several of these factors may affect the quality of the cotton produced, it would appear that there should be a high degree of correlation between the most efficient use of machinery and the production of yield and quality thereof. As these factors all affect the cost of production and the net return obtained per acre, it is believed that every grower should study the size of his acreage and endeavour to ascertain if he is getting the fullest benefits from cotton-growing that he is able to obtain from his farm.

When the possibilities which cotton-growing offers in this State become more fully appreciated, it is considered that the resultant increased area per individual and acreage under cotton will permit of a substantial decrease in the ginning and marketing charges, and may also assist in obtaining a greater return from the seed. It is to be

hoped, therefore, that the difficulties which have been experienced in the spinning industry in this country will be remedied so that the Queensland cotton-growers will have reason to place every confidence in the future of the industry. When this confidence is established it is anticipated that the various factors which have been discussed in this article will become of extreme interest to cotton-growers, and that the value of the suggestions which have been made will be amply demonstrated.

### **QUEENSLAND GOVERNMENT ASSISTANCE TO COTTON-GROWERS.**

The State Government realised when instituting the system of guaranteed advances to encourage farmers to grow cotton, that a careful study of the problems connected with cotton-growing was necessary if the industry was to be permanently established. A Cotton Section has, therefore, been developed in the Department of Agriculture and Stock to deal with the growing of this crop, and the proper grading of the article harvested from it. The personnel consists of a Cotton Specialist, in charge, assisted by a Field Staff under a Cotton Experimentalist, and a Grading Staff under a Cotton Classifier. A Cotton Research Station has also been established in the centre of the Callide Valley, which is one of the largest cotton-growing districts of the State. To meet the annual recurring expenses of conducting the Station, financial assistance has been granted by the Empire Cotton Growing Corporation for a five-year period which terminates at the end of the season of 1928-29.

The activities of the Cotton Section of the Department can be briefly grouped under the following headings:—

- (1) Research investigations into the various problems connected with the growth and development of acclimatised strains of cotton.
- (2) Ascertaining and demonstrating the application of the results obtained at the Research Station to the various climatic and soil conditions existent in the different cotton-growing areas.
- (3) Introduction of the possible suitable varieties of cotton, and the development of acclimatised strains with tests in the different districts.
- (4) Assistance in the conduct of entomological investigations relating to insect pests attacking the cotton plant, with demonstration of the application of prescribed remedial measures.
- (5) The establishment of standards of seed cotton for grading the cotton as it arrives at the Ginnery.
- (6) The classification of the ginned product for marketing purposes.

**The Department of Agriculture and Stock invites the co-operation of cotton-growers in an effort to firmly establish the industry.**

For administrative purposes, the cotton belt, which roughly extends from the Boonah district in the South to the Rockhampton

district in the North, and includes the inland valleys between the Coastal and the Main Dividing Range, has been divided into three districts with headquarters at Ipswich, Maryborough, and Rockhampton. A Senior Field Officer of the Cotton Section is stationed at each of the centres mentioned to conduct the various activities of the section in the respective areas. During the off-grading season, the cotton-graders attached to the Cotton Section are detailed to assist in the conduct of experiments with the grower co-operators.

Each season a total of 100 to 150 experiments are arranged with growers, dealing with varietal and fertiliser tests, investigations in the spacing of the rows and of the plants in the rows, the effect of different heights of thinning, soil studies, &c. Finality is not reached in many of these experiments owing to varying causes, but each season provides an accumulation of evidence on the various problems which eventually may allow definite answers to be obtained in connection with many of them. The conduct of these experiments and the close study necessary to obtain satisfactory results from them have provided an excellent means for training the Field Staff in the problems incidental to the growing of cotton in this State, and it is believed that the Department has a staff of investigators in cotton-growing which will be able to give increasingly valuable assistance to the growers coincident with the development of the industry.

### **Establishment of Research Station.**

Much of the experimental work of the Field Staff, as has been stated, is based on the study of the application of results obtained at the Cotton Research Station. It was appreciated at the beginning of the organisation of the Cotton Section, that many problems existed which would require such careful study that an Experiment Station would be necessary. Accordingly, a Station of 400 acres in area has been developed, of which about 130 acres is under cultivation. A staff is maintained at the Station to conduct the technical investigations relating to problems connected with the growing of cotton. As a result, the effect of different cultural treatments on such factors as the rate of square setting and flowering, the rate and time of opening of the bolls and the fibres contained in them, and allied subjects, can all be carefully studied to much better advantage than in co-operative plots.

The activities of the staff also embrace the studying of such factors as the effect of the rotation of crops, the determination of which are the best crops and varieties thereof to use in rotation, the effect of green manuring and of soils and climatic conditions on the various parts of the plant, and similar subjects. Such data often assists in explaining any peculiar results obtained in experiments, and the experiences of cotton investigators in other countries indicate that the tabulation of such information is essential.

### **Activities of Field and Grading Staff.**

In addition to these features of the activities of the Cotton Section, a comprehensive system of seed acclimatisation has been developed. Marked improvement has already been effected in the commercially grown variety, and there is little doubt that in each successive season the seed supplied to growers will show improvement in quality.

It has been the policy of the Department of Agriculture and Stock to ensure that, if possible, only one variety of cotton should be grown in

Queensland. The experiences of other countries all indicate the many advantages that are to be obtained where it is possible to concentrate on only one variety. It is especially desirable that such should be the case in this State on account of the comparatively small amount of cotton produced, and also of the fact that the crop is sent to only two or three centralised ginneries. A multiplication of varieties would increase the difficulties connected with the storage of cotton of the different grades and staples, and would also endanger the maintenance of the purity of the plant seed. Accordingly, the endeavour to obtain strains of the one variety acclimatised to the different districts is one of the most important features of the breeding work of the staff.

The Cotton Section also co-operates with the Board controlling the Cotton Pool in the heating of the planting seed for the destruction of insect pests. The Department of Agriculture secured two Simon's heaters, which have been loaned to the Cotton Board, and an officer of the Cotton Section is always present to keep a check on the temperatures during the heating operations. As a check on these operations, a range of samples of the treated seed are submitted to the Seed Investigation Branch of the Department for testing as to germination powers. It can be seen, therefore, that a comprehensive scheme for the development, maintenance, and supply of suitable planting seed has been evolved.

It was realised that in conjunction with the development of a Field Staff to deal with the cultural and breeding problems it would also be necessary to develop a system whereby the cotton crop would be properly graded, if the grower is to obtain the full benefit of his labours. The services of a Cotton Classer, with experience in the United States in handling cotton of similar characteristics to those of the Queensland crop, was therefore obtained from Liverpool. A staff of trained wool classers was recruited for training in cotton-grading under the Cotton Classer. Sets of the World's Universal Standards for American Upland Lint Cotton were also obtained and standards for seed cotton which when ginned would give lint values equivalent to the various lint grades of the World Universal Standards were established.

**Cotton-growers would assist the graders if they made an endeavour to blend the contents of each pack.**

### **Uniformity in Grading.**

A marked improvement in the uniformity of the grade within the one bale of lint was obtained under this scheme of operations, and as the graders have been employed for the last five crops a well-trained grading staff is now available. It may be pointed out, however, that the cotton-grower must assist the grader if the proper degree of uniformity is to be maintained. It is not expected that the grower should grade his cotton and pack the different grades into separate wool packs for despatch to the ginnery, but it is considered that each grower should endeavour to blend the contents of each wool pack. Many wool packs as they are fed up the suction spout to the gins show layers of cotton of different grades. The containers had been filled by emptying the picker's sacks straight into the pack, thus forming layers of different grades according to the cleanliness of each picker. Efforts are made to

obtain a uniform grade of such cotton by blending the contents of two or three wool packs as the cotton is fed to the spout, but the same uniformity cannot be obtained as in cases where the grower thoroughly mixes the contents of each wool pack before filling it. This is a very important point and every grower should endeavour to eliminate this variation in grade within the one container. With the enlargement of the areas under crop the tendency to empty the picker's sack straight into the wool pack is increasing, and as a result a larger number of bales containing different grades are being produced at the ginneries. These bales of mixed grade represent an economic loss to the Cotton Board, and while the individual grower may not be penalised in his initial advance, he causes a diminution in the amounts of the final advances which are distributed to all the cotton-growers.

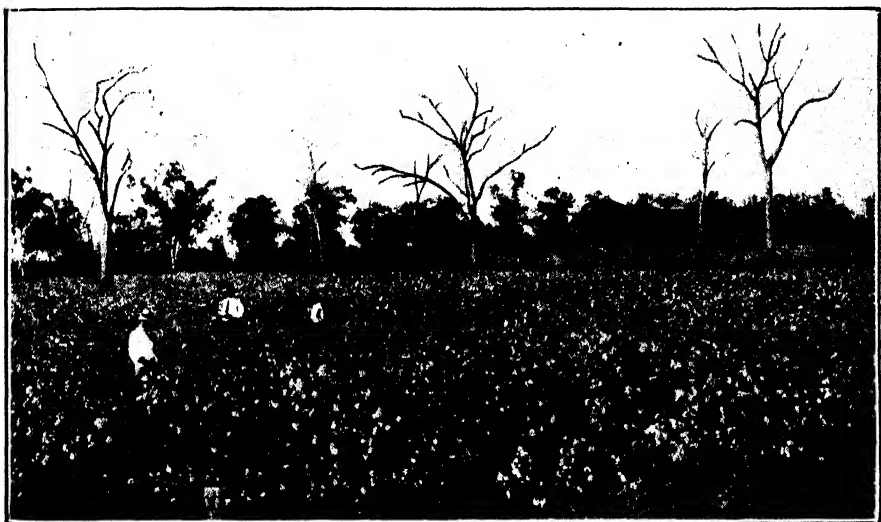


PLATE 129.—A QUEENSLAND COTTON FIELD.

Cotton-growing is playing an important part in bringing into cultivation large areas of country which have formerly been devoted only to cattle-raising. The photograph shows portions of a station which ran about a beast to 10 acres. This cotton crop would average a gross return of from £10 to £15 per acre.

As has been stated, during the off-grading season, graders are attached to the Field Staff to assist in the operations connected with the conduct of experiments. This not only ensures the efficient employment of the graders during the whole year, but affords an excellent opportunity for them to study the effects of the different soil and climatic conditions. This training enables them to understand the nature of the various types of cotton which are received at the ginneries, and assists them in the allocation of the consignments to the different grades and staples.

Samples are drawn from both sides of each bale of lint as it is ginned and are forwarded to the Cotton Classifier for his inspection and determination of grade and length of fibres, or "staple," as the Cotton trade terms it. This permits of a constant check of the work of the graders at the ginneries and any discrepancies are quickly remedied.

Cotton-growers of Queensland can therefore be assured that their crop will be graded carefully and accurately and any mistakes which may occasionally be made are rectified where possible. Any errors which may be made are generally due to the presence of mixed grades in the one wool pack. The growers must co-operate with the graders by sending only the one grade of cotton within the one container. Where more than one grade is included, it is necessary for the grader to estimate the average value of the contents, which is not only unsatisfactory but slows up the grading operations to an appreciable extent.

It can be seen therefore that the cotton-grower of this State has the effective support of the Government in the solution of problems incidental to success in this activity. Undoubtedly there are many problems to be solved before the full possibilities of cotton-growing are realised. Decided progress can be made, however, if more attention is paid to the points which have been discussed in this bulletin. It is confidently believed that with the passage of time information of decided value to the cotton-grower will be obtained from the comprehensive scheme of operations on which the staff of the Cotton Section is now engaged. Such information, combined with the knowledge of cotton-growing which the farmers have gained by experience, should assist to place cotton-growing amongst the profitable primary industries of this State.

### SUMMARY.

**Cotton-growing combines excellently with dairying.**

Briefly, the situation regarding cotton-growing in this State may be summarised as follows:—

1. Excellent yields of cotton can be produced over a large area of country.
2. The favoured cotton country lies between the coastal and the Main Dividing Ranges and the valuation of much of this country is low in comparison with that of the more closely settled coastal areas. A considerable area of Crown land is also available in the districts suitable for cotton-growing.
3. Owing to the distance of these areas to markets for perishable produce, dairying appears to be the most suitable of the older established industries.
4. Cotton-growing combines excellently with the dairying industry—the cultivation period of the former occurring at such a time as to permit both industries to be practised in conjunction. An attractive feature is that the returns from cotton-growing are received during the period when dairy production is at its minimum.
5. The implements necessary for cotton production can also be used in the production of maize or fodder crops. By a combination of cotton-growing with these industries the overhead expenses are distributed.
6. The general average yield of cotton per acre is much lower than individual average yields of many experienced farmers.
7. The average yield per acre can be appreciably improved if more attention is paid to the selection of suitable types of soil for cotton-growing.

8. The general experience of cotton-growers is that early preparation of the seed-bed and planting as soon as possible after the soils have warmed up sufficiently to promote steady growth gives the best results.

9. Early planting appears to be conducive to the setting of a heavy crop before the "wet season" starts. A reduction of the possibility of loss from attack by the Corn Ear Worm (*Heliothis obsoleta*) seems to be associated with well-fruited early-sown plants.

10. The average grower uses a light rate of seeding under the belief that economies in the thinning operations will be obtained. It is believed that the loss of stand as a result of the adoption of this method more than counterbalances any initial financial gain secured through the limitation of the supplies of seed purchased.

11. The thinning and cultivating operations may be performed more efficiently and economically if the proper implements are used at the correct time.

12. The cost of production in Queensland must be reduced, and the increase of the yield per acre offers the easiest means to accomplish this result. It is considered that if more attention were paid to the different features which have been touched upon in this article, the average yield per acre would show a decided increase.

13. A Cotton Section has been developed in the Department of Agriculture and Stock, to assist the growers in the solution of problems connected with growing cotton in this State. Trained Field and Grading Staffs are actively engaged in the investigation of production and the proper preparation of the crop for marketing.

14. A Cotton Research Station has been established where detailed technical investigations can be made in such problems as the effect on the cotton plant of rotation with different crops, green manuring, cultural operations, and soils. Studies are also conducted in evolving and building up supplies of suitable strains of acclimatised seed.

15. A comprehensive system for the supply of plant seed of suitable acclimatised varieties has been developed for the whole of the cotton belt.

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### THE VALUE OF MILK.

On account of the amount of water in milk (writes J. A. Ruddick, of the Canadian Department of Agriculture), it is often thought expensive by many who do not know its real food value. This is chiefly because it is in liquid form, and because it is often used as a beverage. Milk, however, has not as high a percentage of water as strawberries, turnips, tomatoes, oysters, and many other foods in solid form. About four-fifths of the human body is made up of water. Although milk contains such a high percentage of water, it is still an indispensable food, because its solids have all the food essentials, which entitles milk and milk products to the main place in the diet of the young and of the old.

#### THE JOURNAL A GREAT HELP.

*A Mulgeldie farmer writes (9th September, 1928)—"I have seen your Journal with one of my neighbours. It will be a great help for me and my family as newcomers to this country."*

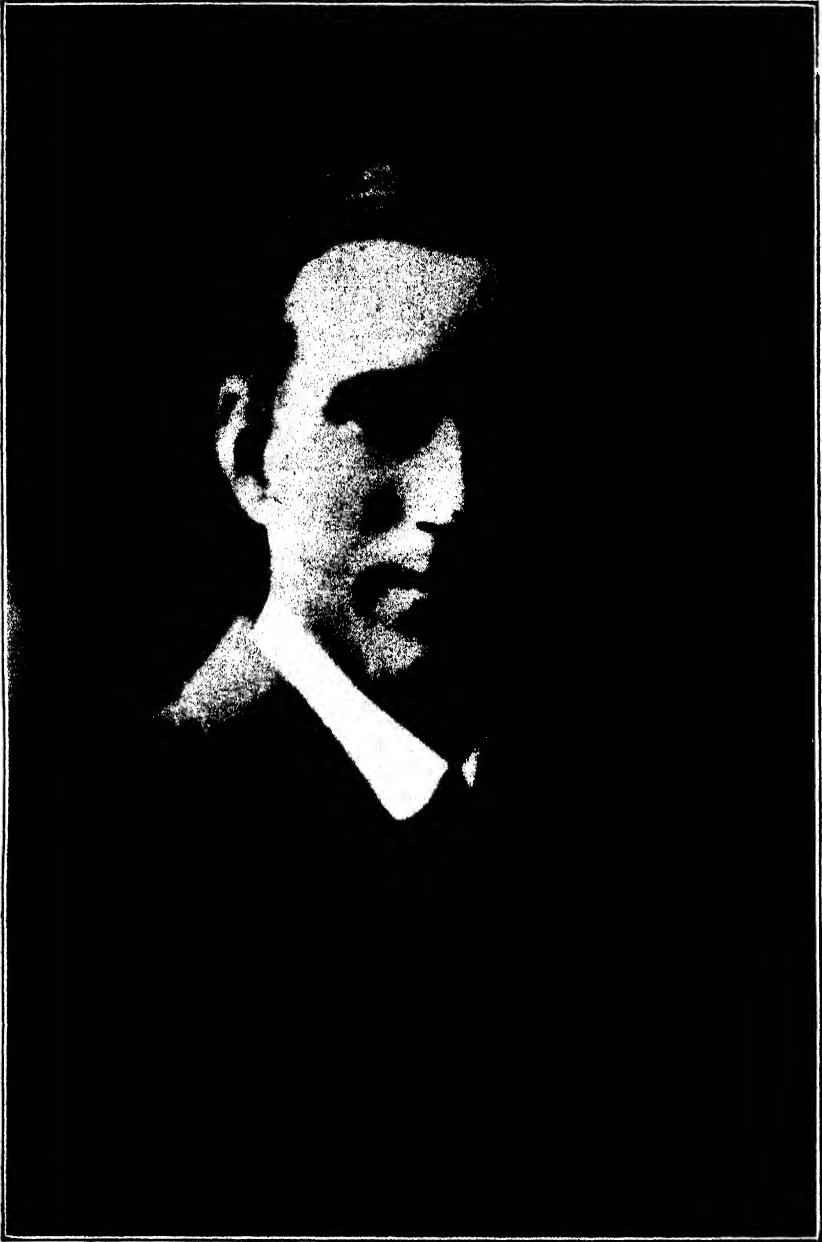


PLATE 130.—THE LATE MR. ANGUS MCTAVISH THORBURN.

**OBITUARY.****THE LATE ANGUS THORBURN.**

It is with profound regret that we have to record the death, on 2nd October, of Mr. Angus McTavish Thorburn, a Field Officer of the Fruit Branch of the Department of Agriculture and Stock. Although he was only twenty-seven years of age at the time of his death, he had crowded into his life more experiences than usually occur to the average public servant. Joining the Department as a boy he immediately set himself to qualify for admission to the clerical branch of the service, and in less than two years he was able, as a result of night studies, to pass the Public Service Examination. In 1917, when only seventeen years of age, he joined the A.I.F. and proceeded with the 42nd Battalion to France, where a serious wound received on the Somme interfered with his promotion to at least non-commissioned rank. Returning to Brisbane he was attached to the Cane Prices Board, and in the capacity of reporter for that body and compiler of costs of production returns he travelled regularly, until 1923, throughout the whole of the cane-growing districts of the State. He then became associated with the Fruit Branch, and in his usual thorough manner at once started to qualify for the technical side of this section. He passed his examination as an Inspector under the Diseases in Plants Act in 1924, and after five months' service at Rockhampton was detailed for the field staff of Southern Queensland. Here he was regarded as one of the keenest and most efficient members of the Branch. For the past two years he was directly connected with the campaign for the eradication of Bunchy Top.

The late Mr. Thorburn possessed a fine character and was an excellent type of young Australian, mentally alert and physically vigorous. By his devotion to duty he won the high respect of his fellow officers and of those engaged in the industry which he served so assiduously and ably. Added to other excellent qualities was an attractive personality which won for him many friends.

A keen yachtsman, he was the first secretary of the Queensland Yacht Racing Association and a popular member of the Royal Queensland Yacht Club. He was also a member of the Sandgate Yacht Club, under the burgee of which he sailed his own boat, the well-known rater, "Venetia." A skilful skipper and a sportsman in the best sense of the term, he was highly esteemed in aquatic circles. He was also a member of the Sandgate Golf Club.

On 3rd October he was laid to rest in the Lutwyche Cemetery. In addition to his sorrowing relatives and more immediate friends the large gathering at the graveside included many representatives of primary producers' associations and the commercial and official life of the city. Among them were Mr. E. Graham (Under Secretary); Mr. Robt. Wilson (Assistant Under Secretary); Professor E. J. Goddard (Dean of the Faculty of Agriculture, Queensland University); Messrs. E. G. Seriven (former Under Secretary); Richard Short (Chief Clerk); Geo. Williams (Director of Fruit Culture); A. Person, H. Collard, J. Stockdale, R. Prest, H. Barnes, Wilkie Lewis, C. Williams, W. D. Wilson, H. Crofts, A. Green (officers of the Fruit Branch); J. F. F. Reid (Editor of Publications); J. P. Orr (Registrar of Co-operative Associations); John Munro and A. Young (Records Branch); C. McKeon and H. Hunter (Agricultural Branch); M. L. Cameron (Dairy Branch); V. Bohan and W. J. Copley (Accounts Branch); T. A. Powell, E. J. Hoey (Central Cane Prices Board); B. Rice, J. Canniffe (Royal Queensland Yacht Club and Q.Y.R.A.); C. Sheehy and V. Short (Council of Agriculture); G. S. Pratten, S. G. Nevill, R. Miller, G. H. Nash, and J. G. Armstrong (Railway Department).

The casket was covered by the Union Jack, and many of his old comrades of the Australian Imperial Force, including a number of his fellow officers in the Department, attended to pay a last tribute of respect.

The sympathy of the whole community which the late Mr. Thorburn served so well is extended to his young widow and stricken relatives.

## ABSTRACTS AND REVIEWS.

### "The Timbers and Forest Products of Queensland."

By E. H. F. SWAIN. Handbook of the Queensland State Forest Service—450 pp., 6 plates. Published August, 1928, with foreword by Hon. Thos. Dunstan, M.L.A., Minister for Lands. Price, postage paid—Paper bound, 6s. 6d.; Cloth, 9s. 6d.

"Queensland is a Treasure House of Fine Woods."—Hon. Thos. Dunstan, M.L.A.

Two hundred odd timbers of Queensland are written up in this book. Each tree is fully described, and the principal points of its identification in the field are set forth with a list of the vernaculars in use in various districts. Its geographical distribution is given, with adequate notes upon temperature, rainfall, and soil environment, for the use of silviculturist and acclimatisator. The timber itself is dealt with in extenso; its colour, weight, texture, and appearance described; its characteristic qualities in use discussed; and its applications in industry carefully inventoried. Both its advantages and disadvantages for various purposes are finally summed up.

The two hundred timbers treated are arranged under the Universal Wood Indexing System, so as to permit of ready reference. The System itself is described, and the reader is instructed how to identify wood for himself. An Index itself is appended which enables the wood user and wood lover to critically compare the Queensland timbers with other well-known woods of the world's commerce. Finally, for the guidance of the wood user, prescriptions in Queensland timbers are offered for every possible industrial purpose.

The book is a thesaurus of the most recent information upon the trees and timbers of the State, their availabilities, values, and uses.

But there is a fund of data also in other directions. For the bee-farmer there is a chapter upon the honey flora of Queensland, together with a monthly timetable of the flowering of the native trees and bushes. The charcoal resources of the forests are discussed; the wood pulping pros and cons are set forth, with notes upon the potentialities of the available native material; the tanning materials of the State are scheduled and described; the grass tree gums, nuts, and other forest products are dealt with, and, finally, there are summarised for ready reading the researches which have been made upon the essential oils of the trees and shrubs of Queensland.

The book is a comprehensive compendium of information upon the trees, timbers, and forest products of Queensland. It is a publication for the forest and timber lover, the wood user, the architect, the timber merchant, the sawmiller, the carpenter, the tanner, the bee-farmer, the arboriculturist, the timber-getter, the chemist, the forester, and the acclimatisator.

It should be used in every school in connection with Nature Study, Rural Economy, and Manual Training. It is very readably written, and the average man will find it interesting and informative. It may be obtained through any bookseller or forest officer or from the Secretary, Provisional Forestry Board, Executive Buildings, Brisbane.

## GRAPE FRUIT.

By GEORGE WILLIAMS, Director of Fruit Culture.

Several varieties of grape fruit (*Citrus paradisi*) have been introduced into this State, and have been found well adapted to local conditions. Unfortunately there has been some confusion in what really constituted a grape fruit, and the "poor man's orange" of various types has been frequently sold under that name much to the detriment of future sales of the genuine fruit. A Japanese variety catalogued as *Citrus natsumikin* has also tended against the improvement of market prospects. Though resembling the real grape fruit in shape and size, the skin is coarse and the flavour and texture more resembling those of the rough lemon. The difference in general appearance may be noted in the illustration in which Marsh's seedless depicts the typical commercial grape fruit. In California this is practically the only variety grown, and so that standardisation may be reasonably effected it is desirable that a similar course be followed here. Triumph possesses a slightly different flavour which may be more appealing to some palates, but the large number of seeds contained is a disadvantage. Several pink-fleshed varieties have more attractive appearance when cut, but are considered deficient in other important respects. The fruit only requires to be better known to be widely appreciated. It is profusely produced from an early age on trees of hardy constitution and good habit.

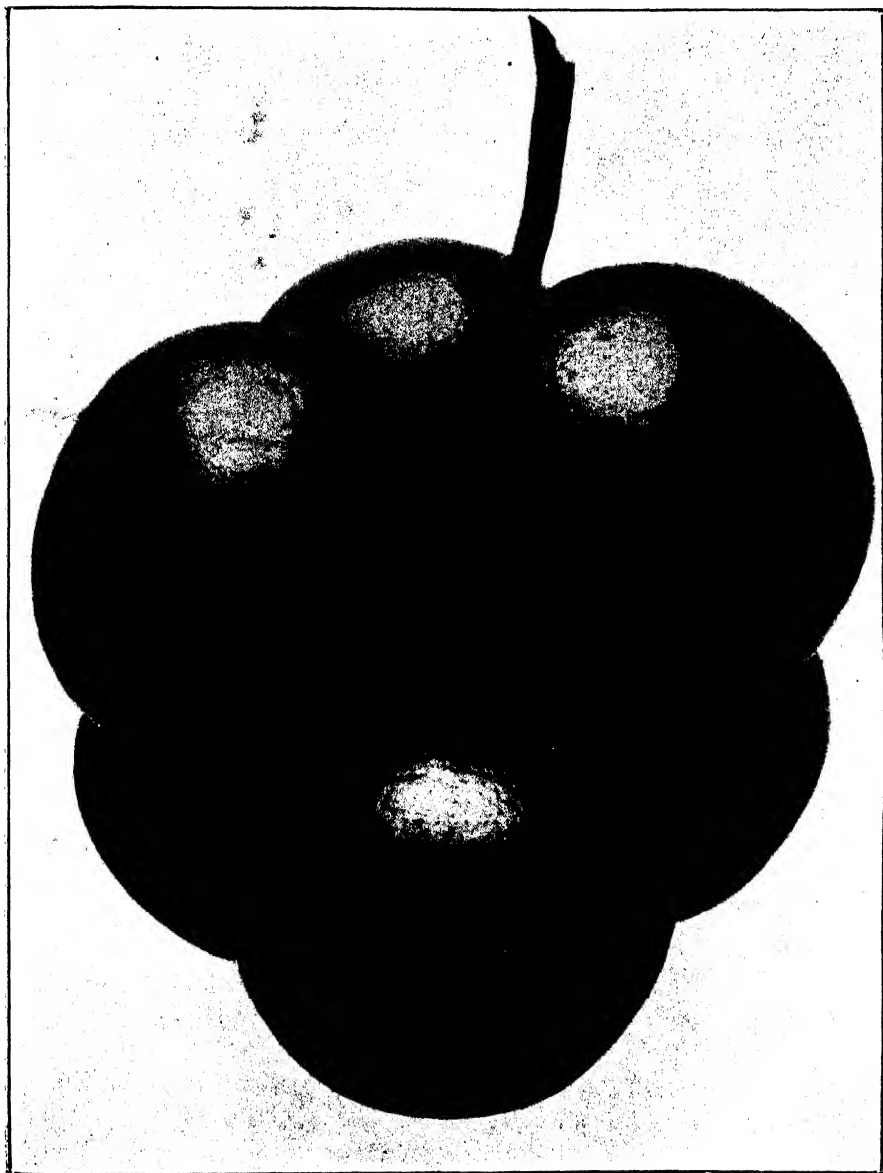


PLATE 131.—MARSH'S SEEDLESS GRAPE FRUIT—HABIT OF FRUITING.

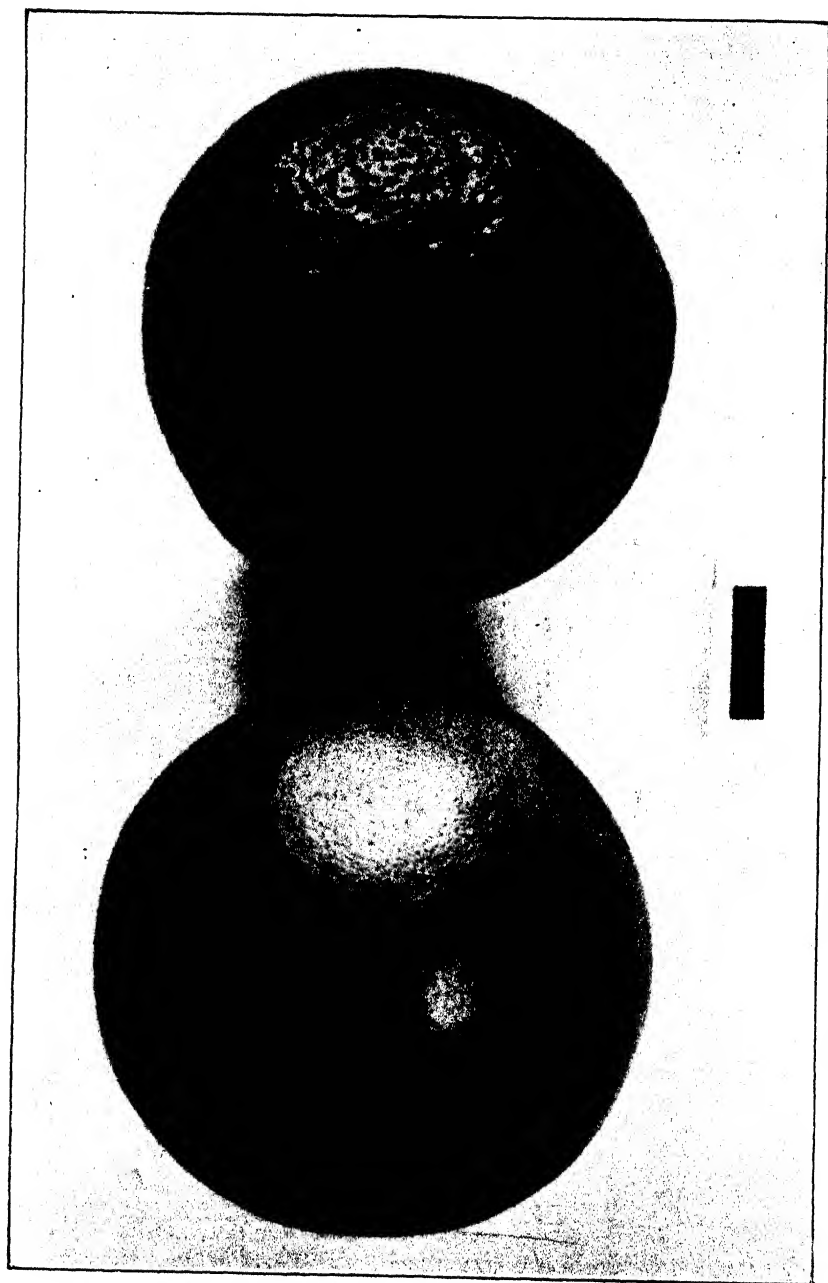
*Citrus natsumikin.*

PLATE 132

*Citrus paridisi* (Marsh's).

## QUEENSLAND TIMBERS FOR FISHING-RODS.

By C. J. J. WATSON, Queensland Forest Service.

**T**HERE is an old proverb which says that "a prophet is not without honour save in his own country." Queensland has many such misjudged "prophets" in timber form. Our native timbers are often thought to be inferior to those imported when used for special purposes, and to many people the name "scrubwood" means "useless."

These impressions are entirely wrong. Because a fishing-rod is made of imported Greenheart or Lancewood, it is not necessarily better than the local product. Provided that the same care is exercised in selecting the best trees, and then cutting and seasoning the timber in the correct manner, Queensland timbers will give better results than the imported ones.

A number of Queensland timbers, mostly scrubwoods, which give excellent results when made into fishing-rods are described below. When it is considered that Maple Silkwood (*Flindersia Brayleyana*) and Red Cedar (*Cedrela australis*) (both kings among cabinet woods) are scrub woods, the term "scrubwood" will not be used in a belittling manner.

**Saffron Heart** (*Halfordia scleroxyla* and *Halfordia drupifera*).—These two woods, also known in different localities as Ghittoo and Kerosene Wood, are so much alike in general appearance and character, that they are sold together as Saffron Heart.

Trees of Saffron Heart occur in coastal rain forests from the border to the Atherton Tableland, with diameters varying from 1 to 3 ft. in mature trees. The best trees occur in the vicinity of the National Park, and in the Atherton district. Supplies for the Forest Service are obtained from Atherton.

Saffron Heart is a hard, heavy, close-grained, highly-elastic and very strong timber. It is saffron-yellow in colour, from which it has been named.

Carefully selected, straight-grained Saffron Heart is more than twice as strong as the best English Oak. Pieces which are sold for "middles" by the Forest Service only  $\frac{1}{2}$  in. square and 3 ft. in length, will carry a weight of over 1 cwt. at the centre, when supported at each end.

Saffron Heart is of a greasy nature, and requires a long time to season properly. If made into a rod when unseasoned, it is much weaker, and will not return to its original shape after being bent. This is common to most timbers. Saffron Heart should not be oiled, as it is already naturally oiled. When finished, all that is necessary is a coat of polish or hard varnish to exclude the air. The wood can be made harder and more "steely" by case-hardening the outside of the piece by twirling it over a flame. This hint has been borrowed from the aborigines of North Queensland, who employed this method to harden their spears. It must be remembered that timber shrinks in drying, so that the "middles" and "tips" should be left a little oversize before placing over the flame. If this is not done, the ferrules will afterwards be found to be too big.

Large supplies of fully-seasoned "middles" and "tips" of this timber may be obtained at a cost of 1s. 6d. each at the Fancywoods Section of the Queensland Forest Service, in William Street. All supplies are guaranteed, and pieces which are broken through faulty grain will be replaced, if returned, free of charge.

**Queensland Greenheart** (*Endiandra compressa*) is a small tree reaching a diameter of about 1 ft. in the coastal rain forests of Southern Queensland. The wood of this tree is extremely hard, close-grained, heavy, and very strong, being equal to Saffron Heart in this respect. The inner heartwood of the tree is a dark-greenish-grey colour when seasoned, and is preferred for rod tips.

**Green Satinheart** (*Geijera Muellertii*) is also known to bushmen as Greenheart, Axe-breaker, Gap-axe, and Glasswood. The heartwood is very hard, close-grained and heavy, and when fully seasoned is highly elastic and very strong. A large number of the trees of this species are cross-grained and very tough, and are useless for rod tips. Only selected timber should be used.

**Brown Spearwood** (*Acacia rhodoxylon*) is another timber which was prized by the aborigines for spears on account of its great strength.

The tree grows slowly in very dry country, and seldom reaches a diameter of more than 10 in. It is common in the Rockhampton district, where it is known as Rosewood Wattle.

The wood is dark chocolate-brown in colour, and is very hard, close-grained, and heavy. When dry it has an enormous strength, excelling even Saffron Heart at times, but retaining its elasticity.

Brigalow Spearwood (*Acacia harpophylla*) is similar in character to Brown Spearwood, and occurs in similar districts having a low rainfall, but it is slightly paler in colour, lighter in weight, and more open-grained.

The remarkable strength and elasticity of Brigalow Spearwood is clearly shown by the following details, kindly supplied by Mr. Cross, who is an expert angler and professional rodmaker. He says:—"A light two-piece rod tapering from 5/16 in. to 1/4 in. at the tip, and 8 ft. long, landed a jewfish 14½ lb. in weight. A similar rod 8 ft. long with a cork butt and weighing only 6½ oz. was sufficient to lift a bream 1½ lb. in weight from the water, and bream struggle hard. Three-piece rods 9/16 in. at the first ferrule (at the top of the butt), 7/16 in. at the second ferrule, and tapering to a 3/16 in. tip will safely lift 7 lb. at the tip."

This is supported by a test carried out by the Queensland Railways, which showed that in bending, Brigalow Spearwood has a modulus of rupture to 25,000 lb. per square inch, which is almost a quarter again as strong as the best Ironbark.

Spotted Irongum (*Eucalyptus maculata*) when straight-grained will give fair service in a rod, but it is not nearly so strong as Saffron Heart and the Spearwoods.

Brown Tulip Oak (*Tarrietia argyrodendron*) makes a good rod if carefully seasoned and made up when it has reached correct stage of dryness. When green, this timber is not elastic, and when too dry it becomes brittle. This tree is very common in coastal scrubs.

Brown Salwood (*Acacia aulacocarpa*) makes a very strong, light rod. The timber is brown in colour, open-grained, and very strong. It is not nearly as heavy as Brown Spearwood.

Trees are fairly common in Southern Coastal Queensland, and are usually found along scrub edges or near creeks. The stems are seldom over 9 in. in diameter, of which a good proportion is pale-coloured and not suitable for rods.

Rod butts may be made from any fairly strong timber which is heavy enough to balance the middle and tip. Those timbers which have a handsome figure are preferred by many fishermen.

One of the most handsome of hard timbers for this work is Tulip Plumwood (*Pteleium socandri*), which when polished shows a striped-brown figure like Tulip.

Other timbers with a good figure are Rose Walnut (*Cryptocarya erythroxylon*) and Red Satinay (*Syncarpia Hillii*), while plain-figured woods which work easily and finish with a smooth surface are Orange Boxwood (*Celastrus dispermus*), Rose Marara (*Weinmannia lachnocarpa*), and Yellow Boxwood (*Sideroxylon Pohlmanianum*).

Most of these timbers can be purchased from the Forest Service in butt size for 1s. per piece.

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## QUEENSLAND RAIN-FOREST TREES.

By W. D. FRANCIS, Assistant Government Botanist.

The Grey Handlewood or Native Elm attains a height of about 60 feet and a stem diameter of nearly 2 feet. The tree shown in the accompanying field photograph is a comparatively small one. The species is known in botanical terminology as *Aphananthe philippinensis*. As the name indicates, the species is found in the Philippines. In Australia it is distributed as far south as the Manning River, according to J. H. Maiden, and has been found as far north as Herberton in Queensland. The wood has been used for axe handles. The leaves are very harsh to the touch, and, on account of the fine, rigid asperities on their surfaces, could be used as a substitute for sandpaper.



*Photo. : W. D. Francis.]*

PLATE 133.—GREY HANDLEWOOD, *Aphananthe philippinensis*.

A tree in the "scrub" near Goodna.



PLATE 134.—GREY HANDLEWOOD, *Aphananthe philippinensis*.

A, flowering twig; B, fruit-bearing twigs; C, coppice shoot.

## THE ALGAROA OR MESQUITE TREE IN CENTRAL QUEENSLAND, *Prosopis juliflora*.

G. B. BROOKS, Senior Instructor in Agriculture.

REFERENCE has been made in previous issues of the "Queensland Agricultural Journal" to this tree, the pods of which are of considerable value as a stock fodder. As showing the interest readers of the Journal take in the subject-matter appearing therein, as a result of an article contributed by the writer on the Algaroba, over 300 applications were received for seed.

This particular distribution was made just prior to the 1902 drought. Many reports have been received from applicants in which they have advised that they either failed to germinate the seed, or were unfortunate in that through adverse conditions the plants perished after transplanting.



PLATE 135.—ALGAROA BEAN TREE, GROWING OPPOSITE WINTON CLUB, WINTON.

Planted 1921, from seed brought from Honolulu. Note height of tree as compared with the post beside it. (Photo. taken 6th March, 1927.)

Subsequent distribution of seed was made by Dr. Reid, of Cairns; and by Mr. Fergus McMaster, Winton. In a communication received from Mr. McMaster it would appear that his efforts to establish this useful tree in Western Queensland are meeting with much success. He says:—"I am herewith enclosing snaps taken of the Algaroba trees growing in the streets in Winton. These are trees from the seeds brought by myself from Honolulu and the trees were planted early in 1921. They have grown exceptionally well and practically without assistance from water, and being planted as they are on a kind of embankment they get very little assistance from what little rain is sent Winton way. The trees are very popular, and I dare say I have distributed 3,000 seeds this year from the trees growing on this place and those at Devonecourt, and the other day I had application for more seeds. Many

of the graziers are planting them about their homesteads. The way that the trees have grown during the last few years, with the sub-normal rainfall that we have had, leads me to believe that over a series of years, when they would have the advantage of heavier rains, the trees would be valuable both as shade and fodder-trees."

In addition to the fifty trees planted at Winton the Algaroba is fairly well distributed throughout the Central Coastal areas. Several trees are to be found in the Gladstone, Baroom, Mount Larcom, Alton Downs, and Rockhampton districts.

From their rapid development when planted in uncultivated land, it is evident that conditions of soil and climate are well adapted to their growth.

The Algaroba usually comes into bearing at the age of four years, when a fair crop of pods is produced. In subsequent seasons the production increases very considerably with the size of the tree.

In the accompanying photographs the respective ages of the trees are, Alton Downs, six years; Pink Lily, five years; and Winton, six years.



PLATE 136.—ALGAROBA BEAN, PLANTED AT WINTON IN 1921, FROM SEED BROUGHT FROM HONOLULU.

The tree on the right is an Acacia, planted about 1905. This Acacia is looked upon as a good tree and this particular one has had considerable attention which the Algaroba has not had. (Photo. taken 6th March, 1927.)

The pods commence to ripen during early summer and drop to the ground when mature. A valuable characteristic is that the tree remains in bearing for a period of some four months.

As evidence that the cattle relish the beans the grower of the tree at Pink Lily, Mr. Edminstone, mentioned that his cows on leaving the milking sheds in the morning go direct to the Algaroba tree and pick up the beans that have fallen overnight. One heifer was so fond of them that she invariably camped under the tree all day and fed on the pods as they dropped.

#### Characteristics of the Algaroba.

In addition to its economic use it is ornamental, and also of value as a shade tree. In regard to its natural habit Mr. L. H. Bailey, Cornell University, in dealing with forage plants, says:—"This small tree is the most common woody plant of the South-western arid region. It is often found in groves with a short trunk like an

apple-tree. It is very valuable as a honey plant, as its period of bloom extends over two months. Its forage value lies in the pulpy edible pods, which are 6 to 10 inches long, containing about a dozen hard seeds."

The pods are very nutritious and are eaten by natives and travellers as well as by stock. The bean pods and bark are rich in tannin. The seeds are said to be the next in value to barley for fattening horses, cattle, sheep, and hogs.

Baron von Muller, in his work on "Select Extra-Tropical Plants," gives the following analysis:—"25 per cent. to 25 per cent. grape sugar; 11 per cent. to 17 per cent. starch; 7 per cent. to 11 per cent. protein; 14 per cent. to 24 per cent.

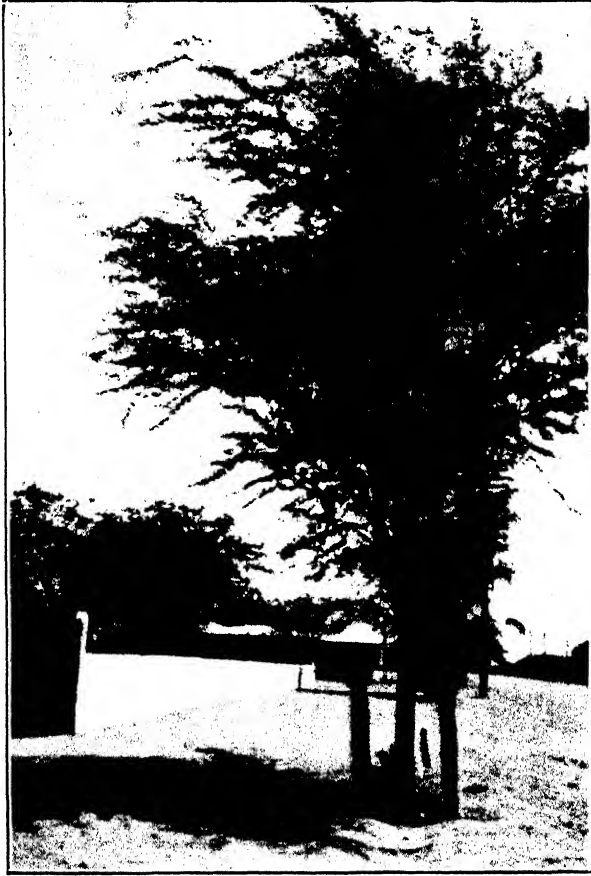


PLATE 137.—ALGAROBA BEAN, PLANTED AT WINTON 1921, FROM SEED BROUGHT FROM HONOLULU. (PHOTO. TAKEN 6th MARCH, 1927.)

organic acid, pectin, and other non-nitrogenous nutritive substances. They are also comparatively rich in potash, lime, and phosphoric acid."

The timber is very hard and durable, resembling *Lignum Vitae*, and takes a polish like mahogany. Fences made of this timber have been known to stand in a perfect state of preservation for more than fifty years in Southern Texas.

A description and illustration of the Algaroba were given by the Government Botanist (Mr. C. T. White) in the "Queensland Agricultural Journal" for June, 1921. It is described as:—

"A tree attaining from 60 to 70 feet, branches usually armed with straight spines, either solitary or in pairs. Leaves bi-pinnate, usually occurring in little tufts or fascicles, pinnae 1, 2, or rarely 3 pairs; leaflets usually 10 to 12 pairs, oblong,

3 to 4 lines long. Flowers small and numerous, borne in long slender spikes of 3 to 5 inches. Pod yellow, shortly stalked, 5 to 8 inches long, marked between the seeds with transverse lines, fleshy with a sweet, sugary, more or less spongy pulp; seeds light brown, enclosed in a hard, parchment-like casing (endocarp).

"A native of South America, West Indies, Central America, Mexico, and the Southern United States."

It is now widely cultivated in tropical countries as a fodder and ornamental tree. Speaking of its introduction into the Hawaiian Island, J. F. Rock in the "Leguminous Plants of Hawaii," states:—The Algaroba is the most common as well as the most valuable tree introduced into the Hawaiian Islands. All the waste lands, which previous to the introduction of this valuable tree were absolutely barren, are



PLATE 138.—ALGAROPA BEAN TREE, PLANTED AT WINTON 1921, FROM SEED BROUGHT FROM HONOLULU.

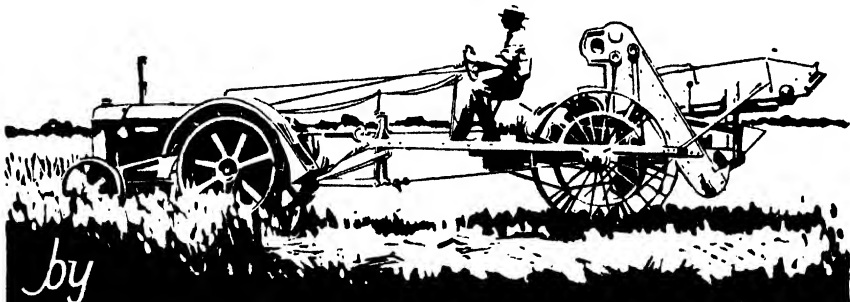
The tree on the left is a Cedar, and probably 25 years old, growing under the same conditions as the Algaroba. (Photo. taken 6th March, 1927.)

now covered with green forests made up exclusively of this tree. The tree was introduced by Father Bachelot in 1828, the seed having come from the Royal Gardens at Paris, France.

#### **Propagation.**

Seeds should be sown in the spring or early summer. The pod contains up to about twenty seeds. Each seed is surrounded by a hard parchment-like casing. This should be removed with a sharp knife before the seeds are sown. C. S. Judd, writing

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8. It ensures better work in dirty crops, as speeds are arranged to suit.
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in a recent number of the "Hawaiian Forester and Agriculturist," found that pouring hot water over the seeds and letting them soak for twenty-four hours greatly accelerated their germination, but they may be sown without any treatment at all, germination then, however, being considerably slower. They should be sown in pots or boxes, and when strong enough the young trees can be planted out into their permanent quarters.

This tree succeeds well in the Brisbane district and fruits well. It is doubtful if it would succeed much further South, as it is more particularly adapted for growing in the warmer parts of the State.

### A Good Fodder Plant.

In view of the prominence that has been given recently to the matter of providing fodder supplies to tide stock through dry periods, more particularly in our western areas, it is somewhat remarkable that more attention has not been given to the propagation of trees and shrubs that provide edible material. It would appear that this subject is receiving some attention in the United States of America.



PLATE 139.—AN ALGAROBA TREE. MR. J. EDMONSTONE'S PROPERTY AT PINK LILY.

### The Honey Locust Tree.

In the September, 1926, issue of the "Journal of Heredity," a publication devoted to plant and animal breeding, a prize of 50 dollars is offered for the discovery of the best honey locust tree. The explanation given for carrying out such a contest is of much interest and worth quoting:—

#### "WHERE ARE THE BEST HONEY LOCUST TREES?"

"We need to have trees on our hills, and crops on our trees—crops to harvest every year—a *tree crop agriculture*. We can have this by applying known science and a little common sense to some of our native trees. In the eastern United States is the Honey Locust, a neglected tree of great promise. Its bean and pod have an



PLATE 140.—AN ALCAROA TREE AT ALTON DOWNS, QUEENSLAND.

analysis as good as that of many commercial grain feeds. Cattle eat the beans of some trees greedily. Trees are known that bear many bushels of beans.

"Here is a possible crop of great value, both as a harvest and as a soil saver through letting tree roots stop gullies. We need to have the best wild trees with which to begin, just as the naval orange business began with finding one tree that happened to bear that kind of fruit.

"Enter this contest and help to start a Tree Crop Agriculture in America."

In the last issue to hand (May, 1928) is an account of the Honey Locust contest, with photographs of the winning trees and pods. Reference is made in the article to the Algaroba stating—

"That the United States Department of Agriculture, in 1923, made extensive milling tests to determine its feeding possibilities. By separating the seeds and the pods (which contain the sugar-bearing tissue) it was possible to make two kinds of meal—one high in sugar, and the other in protein. Actual feeding tests with the mesquite in the South-West and Hawaii have proven its value as a stock feed. In fact, in Hawaii the mesquite, which was introduced in 1828, has assumed an important place in the agriculture of that island.

"The pods are everywhere recognised as one of the most important grain feeds of the islands, and are greatly relished by all kinds of live stock, including chickens. The feeding value of the beans has long been recognised from the practical results obtained. As a feeding material there seems to be only one objection to them, and that is a slight flavour given to milk when fed in excess to the dairy cows. The objection could, however, be overcome by feeding the beans after milking rather than before milking."

The result of the mesquite bean contest was so encouraging that a new contest is being arranged to learn whether trees can be found that exceed those prize winners in yield, hardiness, and food content.

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## THE FAT LAMB.

### Grow Fodder Crops.

Over the bulk of the State where fat lambs are raised, an autumn lambing is found the best, but in the cold districts of the State the lambing takes place in the spring, and the lambs grow during the summer; so that suitable summer crops should be selected and sown to supplement the natural pastures and stubble. In these cold districts fodder crops or extra feed will have to be supplied to produce a satisfactory export lamb, as, besides the fact that the natural pasture in these districts is not of the best, the climatic conditions tend towards slow maturity and a small-framed animal.

In average seasons in the western and south-western districts there is usually sufficient rain in the autumn to ensure a certain amount of growth in the pastures, but for the raising of fat lambs this feed should be supplemented by green fodder crops. In this way every opportunity is given the lamb to get a fair start. The crop should be ready for the ewes to be put into just prior to lambing. This will increase the milk supply, and if alternated with natural pastures there should be abundant feed until the usual spring growth, when the fodder crop can often be allowed to grow up for hay or silage.

### Suitable Crops.

In deciding what crops to grow for fodder, the general farm practice should be considered. It should be made to work in as part of a rotation of crops on the farm, and for that reason a crop other than wheat is advisable. Of those available, the most satisfactory is oats, which, besides being an excellent fodder, helps to control such wheat diseases as "take-all," &c. There are several early varieties which should give excellent results, and which provide more feed, perhaps, than Algerian, but the latter is very satisfactory.

Skinless barley is another fodder crop recommended, and it provides particularly good feed. Rape, or a mixture of rape and barley, will give a great bulk of feed if the season is suitable for a good germination of the rape seed. Rape alone should be fed off with care or losses may occur from "hoven." Lucerne and Sudan grass are two other very valuable fodder crops which the wheat farmer, who combines the fat lamb business with his farming, should find little difficulty in fitting into a suitable rotation.—"A. and P. Notes," N.S.W. Department of Agriculture.

## FLUSHING THE BREEDING SOW.

E. J. SHELTON, H.D.A., Senior Instructor in Pig Raising.

In perusing the pages of several of the older established text-books on "Animal Husbandry," one frequently comes across the term "flushing" as applied to "flushing the mare," or the ewe or the sow or cow or as the case may be, in each instance prior to the time the female is mated.

This "flushing" is not a common term in Australian live stock literature nor is it a regular practice on our farms, consequently an explanation of the term "flushing the sow" before mating will be of interest to readers of this Journal.

The term flushing simply means a general stimulation of the whole of the internal organisation of the animal, the object being to increase the number of pigs produced at farrowing time. The purpose is accomplished by increased feeding of grain or by the use of fresh or more succulent pastures than have previously been available.

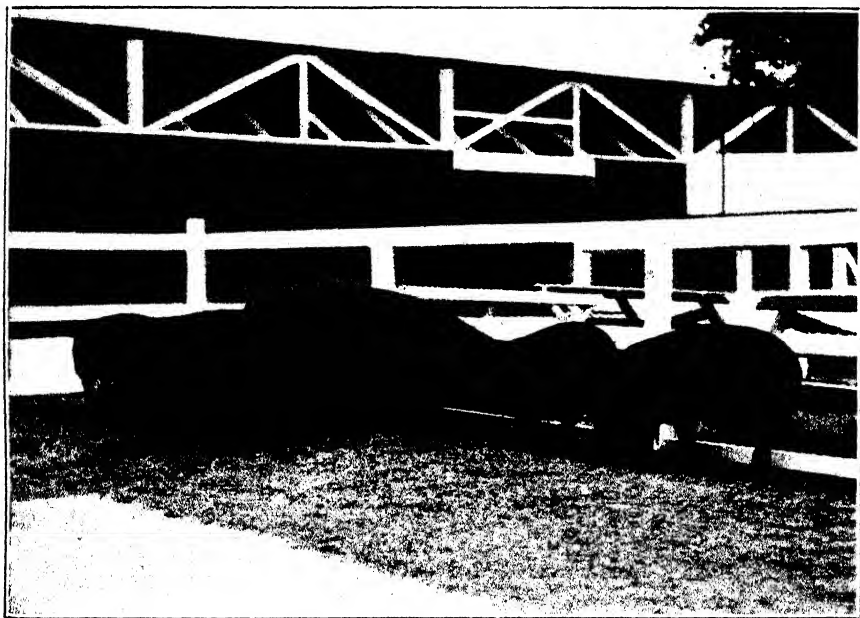


PLATE 141 (Fig. 1).

Duroc-Jersey sow "Lawn Hill Lorna" and a group of her "ton" litter of ten pigs which (not including the sow), weighed 2,000 lb. live weight when one week less than six months old. They were exhibited at the recent Royal National Show at Brisbane by Mr. Percy V. Campbell, of Lawn Hill, Lamington, Queensland, and created considerable interest. This litter indicates what can be done by properly flushing the sow and keeping the feed up to the young pigs from birth. See also Fig. 2.

The practice is understood and practised more by the sheep man than by the breeder of pigs or of most of the other classes of live stock; still it is a well recognised old time as well as modern practice. The sheep man practises it by turning the breeding ewes into a fresh succulent pasture just prior to "joining the rams," the time when the ewes are to be mated, the objective here being to secure a larger percentage of twins or a higher general average at lambing time.

There is no reason why the pig breeder should not adopt the same practice with his breeding sows, especially with sows that are advancing in age and that might otherwise produce rather unsatisfactory litters.

The most beneficial results are obtained when the flushing begins two or three weeks before the breeding season opens or the stock are to be mated. Supposing that the sows have been running on pasture alone during the greater part of the "off" season; at the beginning of the breeding season, or when it is desired to prepare the sows for mating, they should be turned into a fresh patch of rape, lucerne, or other green stuff that would furnish an abundance of the most succulent forage.

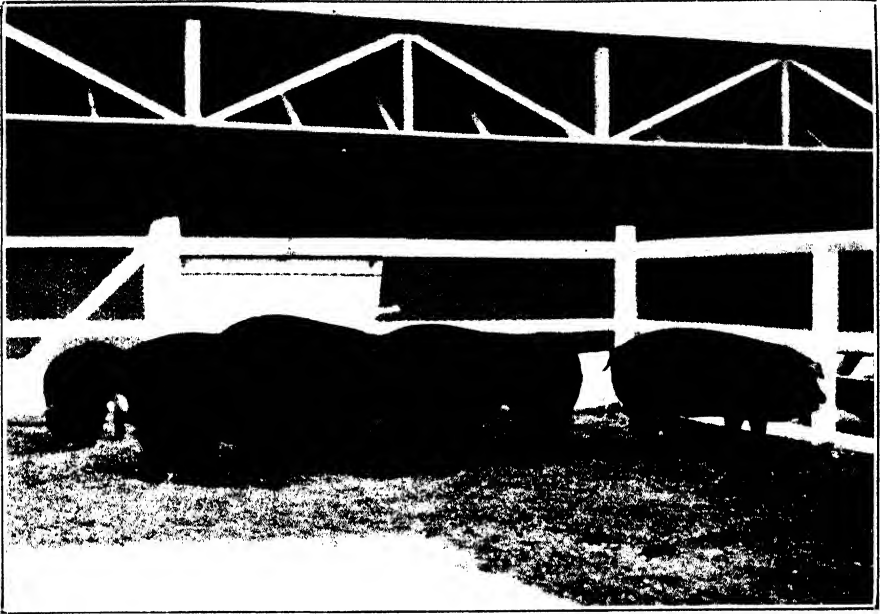


PLATE 142 (Fig. 2).

Representatives of the Ton Litter of Duroc-Jersey pigs exhibited at Brisbane Show, August, 1928. Note good type, quality, and evenness throughout.



PLATE 143 (Fig. 3).

Group of Duroc-Jersey Berkshire Cross pigs, winners of the Litter Weight Contest at the Brisbane Show, 1928. That it pays to follow the practice of flushing the breeding sow is again evidenced in this photograph. Bred and exhibited by Mr. Percy V. Campbell, of Lawn Hill, Lamington.

In the case of a single sow, the breeder might begin by feeding a slop composed of milk and barley or wheat or maize meal, &c., and give more than the usual supply of green food. The idea is to stimulate the whole system without putting on any great amount of fat. It is, of course, expected that the animals will begin to gain a little more rapidly in early spring or as the breeding season opens, and the majority of breeders will see to it that their stock put on flesh at this time, but it is important that the sows should be in medium breeding condition only and be gaining in weight and flesh at the time when they are mated. After the sow has been mated, continue the practice for a week or two before turning her out to pasture again.

All sows should, of course, be kept in good breeding condition during the gestation period, but there is no necessity that they should be "rolling" in fat.

Care should also be taken to see that as soon as possible after service the sow is removed from the boar's pen and placed in a clean pen away from other sows or boars for at least five or six hours, during which she should be liberally fed and kept quiet and in a comfortable condition. It is quite impossible to expect good results by allowing innumerable services and by allowing other sows, mated or otherwise, to interfere with the newly mated sow.

Attention should be paid to these details for the purpose of obtaining better and stronger litters. Many breeders who were not altogether sure about this "theory" in stock breeding have been favourably impressed. Further, the additional care exercised protects the boar and enables him to mate with a larger number of sows with more reliable results than would be possible if the mating were neglected.

Pig production costs are so high these days that no effort should be spared to ensure the production of larger and more vigorous litters. It is quite evident that farmers who have given the most attention to the system of "flushing" above referred to are its most constant advocates.

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### PRECAUTIONS AGAINST SWINE FEVER.

The most potent factor in the spread of swine fever among pigs is undoubtedly the infected pig, which may even pass on the disease to others several days before symptoms are exhibited, says Major C. G. Saunders, in an interesting article in the current issue of the "Pig Breeders' Annual." It must also be remembered that this infectiousness remains during the whole course of this disease. The virus of the disease is also spread through the medium of urine, faeces, eye and nasal discharges; and the floors, bedding, and manure in the pens or stys where infected pigs are housed become saturated with the virus which may be carried from one farm to another, or to different parts of the same farm on the feet of men and animals, or on the wheels of vehicles, and probably by birds. Stock attendants may also, by medium of their hands and any instruments or tools they may use, be the means of spreading the disease far and wide. The chief danger is, however, the infected pig, and attention is specially drawn to the fact that unthrifty pigs may have swine fever without showing any definite symptoms of the disease, and may be moved from one farm to another under the impression that they may only be suffering from some non-contagious disease. Another danger is the pig that has apparently recovered from the disease but is, in reality, suffering from it in a very chronic form, as such pigs may be infective to others for eighty days or longer. Carcasses of pigs which have died from swine fever may retain the virus for months, and even cured meats are not always safe in this respect. Hence the necessity of boiling all offal and garbage before feeding to pigs.

The following precautions will reduce the danger of an outbreak of swine fever:—

- (1) Quarantine all newly purchased stock and all pigs returned from show or market for three weeks in a remote section of the farm, and admit to the main herd only after careful scrutiny has revealed nothing suspicious.
- (2) Locate pig yards and stys away from streams, highways, and keep strangers away from them, and especially pig dealers and persons who have unthrifty pigs upon their premises.
- (3) Buy only from herds that are known to be healthy.
- (4) Do not visit a farm where there are sick or unthrifty pigs.
- (5) Cook all swill and offal before feeding, and make the man that has handled the raw material disinfect himself immediately after.
- (6) After an outbreak of swine fever see that all carcasses are burned or buried deeply with quicklime.

It is well to remark here that in Australia stock regulations compel pig breeders to immediately report to the nearest stock inspector, police officer, or other Government official any suspected outbreak or serious trouble amongst pigs, and to carry out the instructions issued by these officers so that there will be no possible chance of disease spreading from herd to herd. Heavy penalties are imposed upon those who neglect or fail to carry out instructions issued under the Acts controlling these diseases, and the premises concerned may be quarantined for whatever period is deemed necessary. There is everything to gain and nothing to lose by reporting the matter immediately if it is suspected there is anything seriously wrong with the pigs. The Departments of Agriculture in the various States will supply all information relative to these matters upon application free of cost. In any case it would be very unwise to introduce other pigs into such premises that were suspected of being infected until the matter was cleared up and only healthy stock remained on the property, and all buildings and sty's, yards, paddocks thoroughly cleansed and freed of infection.—E. J. SHELTON, H.D.A., Senior Instructor in Pig Raising.

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## PIG RAISING.

### COSTS OF PRODUCTION VARIES.

The cost of producing pork varies widely on different farms. Cost records for a period of five years on representative farms in Greene County, Ohio, United States of America, kept under the direction of John F. Dowler, Assistant in Rural Economics, Ohio Experiment Station, show variation on the different farms ranging from 6.50 dollars to 15.02 dollars for each 100 lb. of pork.

The farms that were most successful in the production of pork seemed to have a number of managerial practices in common, which resulted in lower cost. The sows were well fed before farrowing. Separate houses or shelter-sheds were provided for each sow, and these were placed on new pasture or ground each season.

The young pigs were kept away from straw stacks and feed lots about the barns and other buildings. They were given the run of large fields for pasture in summer and exercise in winter.

Much labour was saved by hogging down corn, using self-feeders, and feeding unhusked corn in the fodder. Plenty of drinking water was provided at all times, and it was prevented from freezing in winter.

Preventive measures were taken against cholera, and treatments were given for the round worm. The pigs were given comfortable quarters, and were kept thrifty and contented from the start.

On the whole, the farms with high cost of pork production were less efficient in feeding and care, and required more labour and larger amounts of feed per unit of gain. The sows on these farms were often too fat or too poor. Straw stacks, stables, and other unsuitable places were often provided for the farrowing sows, and most of the pigs were fed around the barn and in feeding-lots that could not be ploughed.

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## CHOOSING A DAIRY BREED.

By C. F. McGRATH, Supervisor of Dairying.

The question of what breed of dairy cattle is the best has been asked by a number of persons either about to enter or engaged in the dairy business.

It is not so much the question of breed that requires consideration as does the question of profitable producers.

There are good dairy animals that are profitable at the pail in all dairy breeds, and it is true also that poor producers are found in each breed. The selection of animals within the breed chosen is the matter of most importance. The breed chosen should be the one that appeals to personal taste, and that is suitable to the conditions under which the animals are to dairied. Any one of the dairy breeds are worthy of a place on our dairy farms.

The sure way to determine the dairy animal's value is to test it for production. The progeny of animals whose production has been recorded should be secured when possible. The milk producing trait is hereditary, and selected females should be bred to sires with production on paternal and maternal sides.

## Answers to Correspondents.

### Supplying Phosphorus for Cattle.

"FARMER" (Gordonvale)—

There is no need to bother about bone meal as supply of phosphorus for cattle, as we have in crushed Nauru phosphate a cheaper and richer source of phosphoric acid. Make a mixture of one part of coarse salt and two parts of crushed Nauru phosphate, and give the cows about 3 oz. of this mixture in their food every day. Some of the mixture can also be left in addition in troughs, so that the animals can get more if they want it.

### BOTANY.

The following replies have been selected from the outgoing mail of the Government Botanist, Mr. C. T. White, F.L.S.:—

### Specimens Determined.

"DESIROUS" (Clear Mountain)—The specimens forwarded with your letter of the 8th instant have been determined as follows:—

- No. 1. *Eugenia Ventenatii*. Weeping Myrtle. Family Myrtaceæ.
- No. 2. *Dysoxylum rufum*. A small or medium-sized tree, for which I have not heard a common name. It is allied to the Rosewood and Red Bean. Family Meliaceæ.
- No. 3. *Litsea dealbata*. Family Lauraceæ. Allied to the Camphor Laurel.
- No. 4. *Bachhousia myrtifolia*. Carrol.
- No. 6. *Nyssanthus diffusa*. A "Needle." Family Amaranthaceæ.
- No. 7. *Verbena bonariensis*. Purple Top.
- No. 8. *Commersonia echinata*. Brown Currajong. Family Sterculiaceæ.
- No. 5 (but no number on label).—*Solanum auriculatum*. Called Wild Tobacco. Family Solanaceæ. A native of South America naturalised in Queensland. A similar plant with white flowers—*Solanum verbascifolium*—overruns scrub farms in the same way.

### Marsh or Yellow Watercress.

J. McG. (Moombra)—

The specimen forwarded with your letter of the 21st instant is *Nasturtium palustre*, the Marsh or Yellow Watercress, a soft, rather succulent, weed of the cress family (Cruciferae), widely spread over the temperate regions of the world. It has no particular value as a fodder, and like most cruciferous plants, would taint the milk of dairy cows feeding on it.

### Freshwater Algae.

A.H.W. (Laidley)—

The green growth in your dam represents a heavy growth of freshwater algae. The method of dealing with freshwater algae in dams and ponds is, when they are surface species, to spray the surface with Bordeaux mixture of half the usual strength. Bordeaux mixture can be obtained in tins in concentrated form from most of the nurserymen.

For submerged algae, copper sulphate may be put in a coarse sack and dragged backwards and forwards from the bank, or towed up and down in a boat, until it is all dissolved. Copper sulphate is poisonous, and for the water to be safe for water birds and for drinking purposes by man or animals, the copper sulphate must not exceed 1 part in 1,000,000 parts of water by weight (i.e., 1 lb. in 100,000 gallons):—The contents of the pond may be estimated by roughly calculating the cubic capacity in feet, and multiplying the result by 6½. This gives the number of gallons, and a division by 100,000 gives the lb. of copper sulphate required. A second application should be made a week or two later.

Algae give a good deal of trouble in ornamental ponds in colder countries, such as England and the Continent, but here they commonly seem to die with the approach of hot weather.

**PIG RAISING.**

*Replies selected from the outgoing mail of the Senior Instructor in Pig Raising, Mr. E. J. Shelton, H.D.A.*

**Isolation of Sick Pigs.**

J.A.H. (Winegrove)—

The use of cod liver oil in the treatment of pigs affected with a peculiar trouble in the ear is specially recommended. This trouble causes the pig to carry its head on one side and to lose condition. The oil appears to have a very beneficial effect, but it must be carefully handled, care being taken that each pig receives its proper share. The isolation of sick pigs away from healthy stock and special treatment while isolated is always recommended. All treatment must be accompanied by a thorough cleansing of the surroundings, and an improvement in the methods of housing and feeding, for the appearance of disease of this description in the herd is a sure indication that there is a deficiency of mineral matters and vitamins in the food. The supplying of green food, charcoal, bone meal, protein or meat meal, and clean drinking water, and the feeding of readily digestible nutritious food are items requiring special attention. The animal should also be forced to take exercise in the sunshine.

**Feeding Fruit to Pigs.**

T.S.A. (Palmwoods)—

Fruit is of little feeding value for pigs; hence it is not profitable to rely on the products of the orchard as pig food. This is especially so with reference to citrus fruits, for the pig only consumes the juice. Pigs consuming large quantities of fruit are subject to certain gastric troubles, particularly if the food is fed in an overripe or damaged condition, or in too large a quantity at a time. Small quantities of fruit can be used to advantage when fed with other more concentrated foods, such as barley meal or pollard.

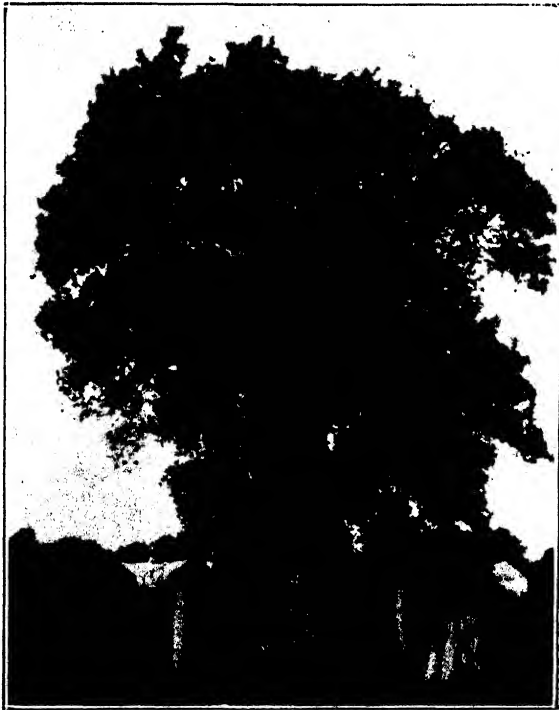


PLATE 144.—W. HENRY'S SEEDLING ORANGE TREE GROWING AT MOORLAND, N.S.W.; Height, 33ft., greatest limb spread, 36 ft. 9 in.; Girth, 3 ft. up trunk, 8 ft. 3 in.; Narrowest Girth, (1 ft. up trunk) 7 ft. 2 in.; Approximate Crop, (1928) 20-25 bushels. About 69 years old. (Note sound oranges (windfalls) on ground piled up.)

### BANANA PROPAGATION.

There is an impression amongst many banana growers that where the plants are raised from the single eye, as is done at the State Nursery at Bribie Island, the quality of the fruit is not equal to that obtained from a well-developed corm or sucker. That this is not the case has been proved by samples of Cavendish fruit recently submitted to this Department, which were  $9\frac{1}{2}$  inches in length by  $5\frac{1}{2}$  inches in girth, and the largest of which weighed nearly  $\frac{1}{2}$  a pound. (See Plate.) Further confirmation is also to hand from a grower at Marian, near Mackay, to whom a number of small banana plants, raised from the single eye at the Bribie Nursery, was sent a couple of years ago. The writer states:—"It may interest you to know the suckers you sent me have done remarkably well, and as we have this season grubbed up a number of them and divided the clumps and planted same we are in a position to state that they are absolutely free from beetle borer or any other disease. This encourages us to extend." This information is very satisfactory, as it shows that even where clean banana plants are set out in a beetle-infested area there is a chance of their keeping free of this pest for some time.—GEO. WILLIAMS, Director of Fruit Culture.



PLATE 145.

A "HAND" OF CAVENDISH BANANAS FROM A PLANT RAISED FROM THE SINGLE EYE, AS PRACTISED AT THE STATE NURSERY, BRIBIE ISLAND. (See note on Banana Propagation.)



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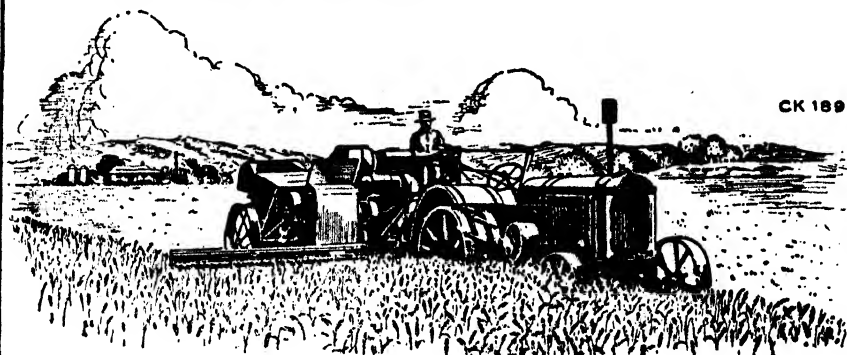
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## General Notes.

### Staff Changes and Appointments.

Mr. G. Sutton, of Camp Mountain, Samford, has been appointed Honorary Inspector under the Diseases in Plants Acts.

Mr. F. J. Watson, Dairy Instructor, Bundaberg, has been attached to the Brisbane District, and Mr. C. L. Moran, Dairy Instructor, to the Toowoomba District.

Transfers of the following Inspectors of Stock have been approved:—Mr. S. C. O. Jessop, from Crow's Nest to Helidon; Mr. S. J. Monaghan, from Julia Creek to Crow's Nest; Mr. L. P. Doyle, from Cloncurry to Julia Creek.

Mr. G. R. I. Anderson, Inspector of Slaughter-houses, Innisfail, has been appointed also Inspector of Stock and Brands.

Mr. F. G. Marks, of Alberton, has been appointed Officer under and for the purposes of the Animals and Birds Acts.

The resignation of Mr. W. B. Smith as Sales and Possessions Officer, Agricultural Bank, has been accepted as from 17th October, 1928, and Mr. Smith has been appointed Inspector, Agricultural Bank, as from 18th October, 1928.

The resignation of Mr. A. W. Furne as Cinematographer, Chief Office, has been accepted, as from 31st October, 1928, as tendered.

The following have been appointed Members of the Southern District Stallion Board:—Messrs. A. H. Cory, M.R.C.V.S., E. Baynes, P. Short, and J. Spratt.

Mr. J. Harold Smith, M.Sc. (Agric.), Assistant to Entomologist, Cairns, has been appointed Assistant Entomologist, as from 22nd August, 1928.

Messrs. F. C. Shaw and P. J. Short have been appointed Temporary Inspectors of Stock, as from 13th and 31st August, respectively.

Mr. J. R. McKinstry, Inspector of Stock, Helidon, has been appointed Officer in Charge, Tick Cleansing Area, South Burnett, with headquarters at Kingaroy.

The appointments of Messrs. A. Dick and S. C. Smith, Inspectors of Slaughter-houses at Ayr and Mareeba, respectively, have been confirmed, as from 20th February, 1928.

Constable N. T. Briskey, of Clermont, has been appointed Inspector of Slaughter-houses.

Messrs. H. G. Springer and W. J. Adderley, of Wolvi, via Gympie, have been appointed Honorary Inspectors under the Diseases in Plants Acts.

Mr. W. R. Winks, B.Sc., Assistant to Analyst, has been appointed Analyst, Agricultural Chemical Laboratory, as from 10th September, 1928.

It has been approved that the designation of the present position of Instructor in Agriculture be changed to that of Senior Instructor in Agriculture, and Messrs. G. B. Brooks, A. E. Gibson, and N. A. R. Pollock, Instructors in Agriculture, have been appointed Senior Instructors in Agriculture, as from 1st July, 1928; that the designation of the position of Instructor in Pig Raising be changed to that of Senior Instructor in Pig Raising, and Mr. E. J. Shelton, Instructor in Pig Raising, has been appointed Senior Instructor in Pig Raising, as from 1st July, 1928; that the designation of the position of Instructor in Sheep and Wool be changed to that of Senior Instructor in Sheep and Wool; the designation of the position of Assistant Instructor in Sheep and Wool be changed to that of Instructor in Sheep and Wool, and Mr. Jas. Carew, Assistant Instructor (and Acting Instructor) in Sheep and Wool has been appointed Instructor (and Acting Senior Instructor) in Sheep and Wool, as from 1st July, 1928.

The Officer in Charge of Police, Millmerran, has been relieved of his appointment as Acting Inspector under and for the purposes of "*The Diseases in Stock Act of 1915*," as from 31st October, 1928.

Mr. L. F. Reinke, of Monto, has been appointed Officer under and for the purposes of the Animals and Birds Acts.

Mr. L. B. Christian, of Waterloo, Yandaran, has been appointed Honorary Inspector under and for the purposes of the Diseases in Plants Acts.

Mr. E. C. Olive, Manager of the State Farm, Kairi, has been appointed Dairy Instructor, Department of Agriculture and Stock.

The Inspector of Stock at Gayndah has been appointed Government Representative on the Burnett Dingo Board.

Mr. C. F. Adermann, of Wooroolin, has been appointed Chairman of the Peanut Board.

Mr. F. C. Coleman, of Grantham, has been appointed Inspector of Dairies, as from the date of taking up duty; his appointment is on probation for a period of six months.

Mr. T. Raymond, of Mirriwinni, Gordonvale, has been appointed an Officer under and for the purposes of the Animals and Birds Acts.

### Pastoral Districts Visited—Proposed Tour of South Western Queensland.

The Minister for Agriculture and Stock (Mr. W. Forgan Smith) stated that, in pursuance of the policy of the Government to make the services of qualified technical officers available to the pastoralists and agriculturists, he had recently arranged for a tour of the Northern and Western cattle and sheep districts by the Agricultural Chemist (Mr. J. C. Brännich) and the Instructor in Sheep and Wool (Mr. J. Carew). Addresses were delivered by these officers, and were apparently greatly appreciated by the stockowners. Lectures were arranged for at Charters Towers, Ashton, Hughenden, Winton, Isisford, Longreach, Springsure, Emerald, and Capella, and these lectures were well attended by owners concerned. In the course of the visit to these districts much information was obtained in connection with the use of licks and the artificial feeding of sheep and lambs, and this information will be utilised in publications proposed to be issued by the Department on the sheep industry.

Orchardists and dairymen were also visited in the Charters Towers district, and the departmental officers were consulted on many problems incidental to their activities.

Arrangements have been made for Messrs. E. H. Gurney, Senior Analyst, and J. Carew, Instructor in Sheep and Wool, to make a similar visit to the South-western areas of the State, and it is intended that these officers should leave Brisbane on the 5th November. In the course of their tour the following districts will be visited on the dates mentioned:—Jondaryan, 5th November; Dalby, 6th to 8th November; Miles, 8th to 10th November; Roma, 10th to 13th November; Mitchell, 13th to 17th November; Charleville, 17th to 24th November; Cunnamulla, 24th to 28th November; St. George, 28th to 30th November; Goondiwindi, 30th November to 3rd December.

On their return they will visit other Downs centres, and are expected to return to Brisbane about the 6th December.

In connection with these visits, the Minister expressed his appreciation of the excellent arrangements made by pastoralists and outlying settlers for the conveyance of the officers through the areas visited.

### Wheat Board Election.

The annual election for the appointment of a member for each of the five State Wheat Board Districts was conducted at the Department of Agriculture and Stock with the following results:—

#### District No. 1 (Maranoa-Dalby)—

Aaron Hoskin (Mount View, via Jimbour)	..	..	..	273 votes
*Robert Swann (Wallumbilla)	..	..	..	120 votes

#### District No. 2 (Old Pittsworth Electorate)—

Arthur Carl Krieg (Brookstead)	..	...	..	487 votes
*Edward Fitzgerald (Felton)	..	..	..	405 votes

#### District No. 3 (Warwick-Killarney)—

*Bergittinus C. C. Kirkegaard (Freestone)	..	..	..	286 votes
Thomas Braithwaite (Warwick)	..	..	..	127 votes
Joseph James Booth (Junabee)	..	..	..	60 votes

#### District No. 4 (Allora-Clifton)—

W. J. T. Neale, Allora (Unopposed)

#### District No. 5 (Toowoomba and Lockyer)—

*John Archibald (Oakey)	..	..	..	182 votes
Patrick McNee (Kingsthorpe)	..	..	..	126 votes
William Garvey (Gowrie Little Plain)	..	..	..	80 votes

\* Retiring member.

The successful candidates will hold office for a term of one year as from the 1st September.

### Levy on Growers of Papaws.

Regulations under the Fruit Marketing Organisation Acts have been approved, empowering the Committee of Direction to make a levy payable by growers of papaws at the rate of 1d. per bushel case of papaws sold by them. The sums raised by the levy shall be expended only upon advertising in the interests of the growers concerned.

### Canary Seed Board.

An Order in Council under the Primary Producers' Organisation and Marketing Act has been passed, the effect of which is that the present members of the Canary Seed Board shall hold office only until the 30th November, 1928, instead of 22nd December, 1928. Members appointed from the 1st December, 1928, will hold office until the 28th February, 1930. Nominations will be received by the Returning Officer, until 7th November, 1928, for election as Growers' Representatives on the Canary Seed Board to hold office from 1st December, 1928, to 28th February, 1930. Two such representatives are required.

### Sugar Levies.

Regulations under "*The Primary Producers' Organisation and Marketing Act of 1926*" have been approved, providing for levies by the Queensland Cane Growers' Council, District Cane Growers' Executives, and Mill Suppliers' Committees, on suppliers of sugar-cane to mills during the season 1928. The total of the levies per ton of cane supplied to each mill is as follows (total levies for 1927 are given in parentheses for comparison):—Mossman Central, 5½d. (6½d.); Hambledon, 2½d. (2½d.); Bahinda Central, 1½d. (2½d.); Mulgrave, 1½d. (2½d.); South Johnstone, 4½d. (5½d.); Goondi, 3½d. (5½d.); Mourilyan, 3½d. (5½d.); Tully River Central, 4½d. (5½d.); Macnade, 2½d. (3d.); Victoria, 2½d. (3d.); Kalamia, 2½. (3½d.); Pioneer, 2½d. (3½d.); Inkerman, 2½d. (2½d.) Invicta, 2½d. (4d.); Proserpine Central, 3½d. (4½d.); Cattle Creek Central, 2½d. (3d.); Plane Creek Central 2½d. (3d.); Marian Central, 2½d. (3d.); North Eton Central, 2½d. (3d.); Pleystowe, 3½d. (4d.); Racecourse, 2½d. (3d.); Farleigh, 2½d. (3d.); Qunaba, 2d. (2½d.); Bingera, 2½d. (3d.); Fairymead, 2½d. (3½d.); Gin Gin Central, 2½d. (2½d.); Millaquin, 2½d. (2½d.); Isis Central, 2½d. (3½d. Booyal, 4d. Pialba); Childers, 2d. (2½d.); Maryborough, 2½d. (2½d.); Mount Bauple Central, 2½d. (2½d.); Moreton Central, 3½d. (4½d.); Rocky Point, 2½d. (3d.).

No poll will be taken in respect of the general levy by the Queensland Cane Growers' Council (¾d. per ton), but before the other levies are made, growers are given the opportunity of petitioning, before 1st October, 1928, for a poll to decide whether or not any particular levy shall be made. In the case of the levy of 1d. for a Defence Fund for the Queensland Cane Growers' Council, the petition must be signed by at least 100 canegrowers. In the case of the levies of various amounts for the District Executives and Mill Suppliers' Committees, petitions must be signed by at least 100, or 50 per cent. (whichever shall be the less) of the cane suppliers to any particular mill. The levies by District Executives and Mill Suppliers' Committees will be utilised for administration purposes of the respective Executives and Committees in the respective districts.

### Additional Sanctuaries.

By Order in Council under "*The Animals and Birds Acts, 1921 to 1924*," the lagoon and one-mile depth of land surrounding same on the property of Mr. A. J. Hay, Taroom, has been declared to be a sanctuary for animals and birds.

An Order in Council has been approved under the Animals and Birds Acts, declaring the properties of Frank Fraser, Ltd., and of Thomas and Honoria Kirkwood, both properties being in the Herbert River district, to be sanctuaries for animals and birds.

### Advances to Maizegrowers on Atherton Tableland.

By Order in Council under "*The Primary Producers' Organisation and Marketing Act of 1926*," the Atherton Tableland Maize Board has been empowered to make harvesting advances (including advances for picking, shelling, and carting) to maize-growers on the Atherton Tableland, on growing crops or on shelled or unshelled maize already harvested but still in possession of the maizegrowers, or on maize delivered to the Board's silos. Such advances shall not exceed £2 per acre of any one grower's growing crops or £2 per ton of his shelled or unshelled maize.

### **Foxes a Pest in Sugar Districts.**

A Regulation has been issued under the Sugar Experiment Stations Acts, making foxes a pest for the purposes of that Act.

### **For Good Quality Cream.**

To make certain of always producing the highest quality of milk and cream, care is essential during all stages of production. The cardinal requisites are enumerated as follows:—

- (1.) Healthy cows and attendants.
- (2.) Wholesome feed and pure water.
- (3.) Strict attention to cleanliness.
- (4.) Prompt cooling.
- (5.) Protection in transportation.
- (6.) Frequent deliveries to factories.
- (7.) Absence of feeds and weeds that produce objectionable odours and flavours.

### **Victorian "Reso" Tour.**

Following on the success of the recent "Reso" Tour of Victorians to Queensland, the Commissioner for Railways (Mr. J. W. Davidson) has received many requests for the organisation of similar tours to Victoria.

In conjunction with the New South Wales and Victorian Railways, arrangements have, therefore, been made for a "Reso" Tour of Queenslanders to Victoria to commence from Brisbane on Saturday, 1st December. The tour, which will occupy ten days from Brisbane to Brisbane, will be confined to men only, and will provide a unique opportunity for Queenslanders to enjoy a personally conducted tour to Victoria and the new Federal Capital.

The organisation of "Reso" Tours, which are run at an all-inclusive fare, is of high standard, and no effort is spared to ensure the comfort and welfare of those participating. Apart from the facilities afforded for inspecting the various industries and resources of the districts visited, Resonians have the privilege of meeting representative citizens, and the resultant interchange of ideas and discussion of mutual interests, which is to the advantage of both parties, has been found to be of inestimable value in bringing about a better understanding and a spirit of closer co-operation between the people of the different States and districts.

The Victorian tour is of particular interest to farmers, graziers, and fruit-growers, the itinerary being specially arranged for their benefit. Preliminary arrangements are now being made for the reception of the visitors in Victoria, and everything possible is being done to ensure a most interesting and enjoyable tour.

The itinerary, as will be seen from the following brief particulars, is most varied and comprehensive in its scope, and is one which should appeal very strongly to Queenslanders.

The Resonians will leave Brisbane by the Sydney mail train on Saturday morning, 1st December, and will spend Sunday in Sydney. Early on Monday morning they will arrive at Corowa, on the Victorian border, a district noted for its sheep and wheat, and in the afternoon they will reach Rutherglen, famed for its vines and wines. On the Tuesday morning the party will visit Shepparton, the centre of Victoria's fertile Goulburn Valley, and one of the largest fruitgrowing areas in Australia. Here is situated one of the most modern canneries in Australia, capable of processing 100 tons of fresh fruit daily. The afternoon will be spent among the sheep and citrus fruits at Echuca, the principal town and port on the Murray, and the centre of a prosperous agricultural area and of a big irrigation scheme. The next day the party will visit Horsham, the heart of the wealthy Wimmera district, and renewed for its wonderful wheat crops, its wool, and fat lambs. On Thursday, 6th December, the morning will be spent among the beef cattle at Hamilton, in the western district of Victoria, and in the afternoon the rich pastoral district of Casterton will be visited. The Resonians will spend Friday, 7th December, in Melbourne, and on the following day they will make an inspection of Canberra, the new Federal Capital City. After a short stay in Sydney on Sunday, 9th December, the party will return by mail train to Brisbane, where they will arrive on Monday evening, 10th December.

The number in the party will be limited to sixty, and the price to be charged for the tour is £45, which includes first class fare by rail, sleeping berths, meals, accommodation, motor car hire, &c. Those desirous of participating in this tour should communicate immediately with the nearest station-master or the Secretary to the Commissioner for Railways.

### Diseases in Stock Act.

Orders in Council under the Diseases in Stock Act have been issued, declaring:

- (1) That Westmoreland shall no longer be a crossing-place for stock from the Northern Territory.
- (2) That the Buffalo Fly is and shall be a disease under and for the purposes of "*The Diseases in Stock Act of 1915.*"

### The Royal Society of Queensland.

The Ordinary Monthly Meeting was held in the Geology Lecture Theatre on Monday, 27th August, 1928, at 8 p.m.

The President, Professor T. Parnell, in the chair, and about thirty members present.

Mr. L. L. S. Barr and Dr. John Bostock, M.B., B.S., D.P.M., M.R.C.S., L.R.C.P., were elected ordinary members of the Society.

The President referred to the death of Mr. W. R. Colledge, and expressed the Society's appreciation of his work.

Professor H. C. Richards communicated a paper entitled "*A Geological Reconnaissance of Part of the Aitape District, Mandated Territory of New Guinea,*" by H. G. Raggatt, B.Sc., of the Department of Mines, Sydney. The general geographical features of the area are as follow: (1) The Coastal plain is about one mile wide at Ulaui, and reaches a maximum of approximately 12 miles at Sissano. It is so little raised that the streams which flow through it inevitably meander as they approach the sea, in some places forming deltas with numerous distributaries. With the exception of Vanimo, there are no deep water bays of importance. (2) The Coastal foothills are a well-defined area between the plain and the main dividing range, and have an average height of about 500 feet. The streams are relatively swift flowing and deeply entrenched. (3) The Dividing Range here does not exceed 5,000 feet in height and is enclosed in thick jungle. (4) The Inland slopes, populated by the Wa-pi tribe, are little known.

The rocks exposed were provisionally classified. They include pre-Cretaceous schists and gneisses of the main dividing range; pre-Miocene (possibly Mesozoic) altered sediments; Tertiary (probably Miocene) beds of blue micaceous mudstone alternating with shale and sandstone, and of limestone; late Tertiary (probably Pliocene) beds of limestone, volcanic rocks, conglomerate, sandstone, and agglomerate; recent and Pleistocene estuarine and river beds, river gravels, sands, and muds. Palaeontological notes were supplied by Messrs. Tom Iredale and W. S. Dun. It was suggested that the search for oil be confined in the first place to locating suitable structures in beds of Miocene age which have not been too highly folded or much intruded by igneous rocks. The paper was discussed by Sir-Edgeworth David, Mr. J. H. Reid, and Dr. E. O. Marks.

Professor H. C. Richards exhibited a specimen of clay shale with a curious chocolate iron-staining pattern. The specimen, which was forwarded by Mr. T. Blatchford, the Government Geologist of Western Australia, has a very unusual pattern which, owing to its regularity and nature, suggests a possible organic origin. It came from a locality 80 miles south-east of Wyndham, Western Australia, and underlies the Salterella beds. Mr. Blatchford has obtained other specimens of similar pattern in the Braeside area from the Nullagine series. The finder is anxious to have an adequate explanation of the origin of the pattern, and hopes that such may possibly help in fixing the age of the Nullagine beds more accurately.

Professor Richards also exhibited precious opal from a quarry in the Brisbane tuff at Kedron. This was forwarded by Mr. Huxham, an engineer of the Brisbane City Council, and had been obtained during quarrying operations from "porphyry" metal. The exhibits were commented on by Dr. Bryan, and an informal discussion took place.

The Council wishes to draw the attention of members of the Society to an announcement by the Royal Society of New South Wales that a prize, known as "*The Walter Burfitt Prize,*" has been established by that Society. The prize is awarded at intervals of three years to the worker in pure or applied science, resident in Australia or New Zealand, whose papers and other contributions published during the past three years are deemed of the highest scientific merit, account being taken only of investigations described for the first time, and carried out by the author mainly in these Dominions. The prize consists of a medal and the sum of £50, and may be awarded to two authors working in collaboration. The first award will be made in May, 1929, and nominations and publications should be submitted to the Royal Society of New South Wales not later than 28th February, 1929.

### Parakilya.

The Minister for Agriculture (Mr. W. Forgan Smith) stated to-day that he had received the following comments from the Government Botanist, Mr. C. T. White, on the recent report in the "Courier" of an interview with the Rev. J. Andrew Barber, Patrol Organiser of the Australian Inland Mission:—

"The plant 'Parakilya' is well known to Queensland pastoralists. It is fairly common in parts of Western Queensland extending through Central Australia to the eastern parts of Western Australia. The actual fodder value has not been ascertained by chemical analysis, though the fact that stock do well on it seems fairly well established; it is not known, however, what other fodder is picked up with the Parakilya. It is one of those succulent plants, characteristic of arid regions, that is able to store water by virtue of a protection of a tough skin or cuticle. Such plants when fed on enable stock to go for a long time without drinking. Although the collection of Parakilya seed presents no great difficulties, it is just a moot point as to how the plant will lend itself to being artificially spread; in its native state it favours sandy soils. However, the experiments to be carried out by the Australian Inland Mission will be followed with great interest by the Department and by pastoralists of Queensland.

"Sir Arnold Theiler, the noted South African Veterinarian, when he was in Queensland recently, spoke of the possibilities of what they know in South Africa as Spekboom. It is like the 'Parakilya' and is a member of the Pigweed Family, but in place of being a small herbaceous plant it grows to a fair-sized shrub. It has been grown to a limited extent in Queensland, but more as a curiosity in gardens than as a possible fodder. In South Africa it has been recorded that this succulent plant along with the Australian Saltbush, makes a valuable mixture for stock; it would seem advisable to make trials with this plant at the same time as the 'Parakilya.' "

### The Buffalo Fly.

The Minister for Agriculture and Stock (Mr. W. Forgan Smith) views with apprehension the possibility of the extension of the Buffalo Fly into Queensland. This fly, which is a menace to the cattle industry of the States, has been known to exist in the Northern Territory and in the northern portion of Western Australia for some years. The trend of the spread of the fly from the Northern Territory is in an easterly direction, towards the Queensland border, and the extensive movement of stock from that Territory increases the possibility of the introduction of the pest into this State.

In 1925 the Council for Scientific and Industrial Research appointed a veterinary officer to investigate and report on the incidence of the fly in the Northern Territory and Western Australia, and his report indicated its extension towards the border of this State, north of the 18th parallel.

The danger was promptly realised by the Queensland Government, and the possibility of the introduction of the fly into this State was emphasised in a communication addressed to the Prime Minister, in which it was suggested that he should exercise every effort to prevent an extension of the pest.

As 1927 was a drought year in the Northern Territory and North-western Queensland and there were practically no stock movements, special action was not taken to deal with the matter, but during the present year, as the Commonwealth Government did not appear to realise the urgency of protective measures, the Queensland Government detailed a veterinary officer to make a survey of that portion of the Northern Territory contiguous to the Queensland border. In his report, this officer verified previous information available, which was to the effect that the fly had materially extended and had now become a direct menace to the cattle and horses in this State.

Mr. Forgan Smith is strongly of the opinion that a national effort to deal with the pest should be made, and that the Commonwealth Government should take urgent action, not only to combat the pest in the Territory under its administration, but also to prevent an invasion to the Eastern States of the Commonwealth of the fly. The Minister stated that he was prepared to co-operate in a reasonable manner in any efforts which might be made to prevent the introduction of the pest into Queensland, but emphasises the obligation of the Commonwealth Government to treat this matter from a broad, national standpoint in order to afford protection to the cattle industry of the Commonwealth.

### Higher Interest on Savings.

An announcement of more than passing interest has been made by the Commonwealth Bank.

From the 1st October, the rate of interest on Commonwealth Savings Bank deposits will be 4 per cent. up to the first £500, the old rate of 3½ per cent. still to be paid on excess of that amount up to £2,000.

As the majority of savings accounts probably have balances of less than £500, the announcement will come as very good news to most Savings Bank depositors, and as a distinct invitation to those people who do not yet use this useful aid to thrift—the savings account.

Another feature of the Commonwealth Savings Bank service is the Purpose Account. Any number of Purpose Accounts may be opened at any branch of the Bank, and the nature of the purpose need not be disclosed. The objective may be provision for holiday expenses, Christmas extras, medical expenses, higher education for the children, or the purchase of expensive articles, such as pianos, cars, wireless sets, &c.

Any sum from 1s. per week or per fortnight may be deposited for a period of not less than three months, and the interest will be added at the end of the period at the rate of 4 per cent. per annum.

### The Public Curator Office—a Profit of £4,065.

From the annual report of the Public Curator to the 30th June, 1928, it is ascertained that the year ended with a profit of £4,065, bringing the total profits earned by the office since its inception in 1916 up to £53,863, which sum is credited to the Reserve Fund. As the office functions under the guarantee of the State, this Reserve Fund is available to cover any losses (if any should, unfortunately, be made) before the Government will be called upon to honour its guarantee.

For the first time in the history of the office, the total cash receipts have exceeded the million sterling mark, viz., £1,110,280, and the disbursements amounted to £1,099,004, or a gross turnover of £2,200,000.

The number of Wills and Trusts administered and taken over during the year was 1,778, of the estimated value of £2,009,763, being an increase of £189,480 over the previous year.

The number of Intestate Estates administered and Elections filed was 2,222, of the value of £917,143.

The Unclaimed Money Fund has increased from £121,371 to £140,346, and the amount invested in Government Debentures aggregates £139,500.

In 1916, the first financial year of the Office, the Cash Investments amounted to £97,071, whereas for the year ended 30th June, 1928, they amounted to £870,757.

The progress of the Office is most marked, and is steadily mounting upward year by year. No complaints of any substance have been received, but on the contrary many letters of a highly appreciative nature, concerning the good work of the administration, have come to hand.

The most careful attention has been given to economical management, and notwithstanding the large volume of new business and the distribution of so many estates, there has been only a slight increase in the working expenses of the previous year, and this is accounted for by the statutory increments to the salaries of the staff.

Further evidence of the remarkable confidence shown by the public in the Office is afforded by the constant inflow of Wills completed by living persons appointing the Public Curator executor. On the 30th June last, the total number of Wills made by the Public Curator exceeded 25,000.

The management of such a large number of estates as the Public Curator controls, entails great activity in the investment of money. Up to the present a sum of £657,843 has been invested out of the Common Fund on mortgages and in Government Debentures.

The Public Curator Office is self-contained, accepts responsibility for its own finances, and has always been able to pay its own way and to meet its obligations. While the Office enjoys the guarantee of the State, it has made no call on the Consolidated Fund for any help, and with its strong reserves built up out of its own profits, it is unlikely that it ever will.

# The Home and the Garden.

## HARMONY OF ASSOCIATION.

By A.K.W.\*

The garden glows,  
Against its wall the city's heart still beats,  
And out from each summer wind that blows,  
Carries some sweetness to the tired streets.

Whether your home is built on a small city allotment, or on a large suburban piece of ground, by careful planning and consideration the beauty of both may be enhanced. The house and garden should make a complete picture, and this is achieved by keeping a natural or landscape appearance, with simplicity the main object.

It is always desirable to build a home on the highest elevation, and the main front of the house facing north-east. Where the ground is sloping the possibilities of a garden are boundless. Terraces and steps leading from one level to another make a pleasing feature, especially if the terraces are walled up, and creeping, flowering plants grown in a bed along the top edge of the wall, where the plants will fall over and make an array of colour from the terrace below.

The garden should be laid out in relation to the doors, windows, verandas, and steps of the house. The path leading from the front gate should be so designed that the open door is not visible from the street. By careful planning, a garden may serve many purposes. A distant view may be improved by a foreground of shrubs or flowers; unsightly buildings may be hidden by care in planting.

It may not be possible to lay out the garden when building a home, but it should be planned from the beginning, so that there is no wasted labour in rearranging a garden. A most attractive garden may be made on a small scale on a small piece of ground, and often it is the small garden which produces the greatest number of flowers. During the summer the rich colouring of flowers, the green of grass and trees, and a certain amount of shade will prove a never-ending source of delight to the home-lover, and will add considerably to the value of the dwelling.

All natural features must be considered, and generally the smallest gardens must be the most formal. Where there is a long, narrow path from house to gate, the length of the path is apparently reduced by beds of gay flowers on each side, or its long straight line may be broken by a creeper-covered arch. The lawn of a small home should not be broken up by beds of flowers or shrubs. Shrubs may be planted to hide the boundaries of the ground, and curving paths disappearing behind beds of high-growing flowers tend to make a small garden appear larger.

There is so much outdoor life in sunny Queensland, and so much time may be spent in a garden, that it should be made a restful, beautiful part of a home—a vital part, not merely an adjunct to residence. Most gardeners do not express individuality in their gardens. Very often each garden in a street is laid out in much the same way. Year after year the same annuals are planted in the same beds, as most amateur gardeners do not care to grow plants they know little about.

Garden features, such as seats, summer-houses, pergolas, and sundials should receive more attention. A well-built, substantial garden seat would add considerably to the comfort and beauty of a garden. Such a feature would raise a garden from the common-place, and its beauty would be increased as the seasons pass—gay annuals and roses in the spring, and gold and tawny chrysanthemums and dahlias in the autumn, blooming in the surrounding beds.

Fences may be covered with creepers, which will give an old-world walled appearance to a garden, and form a background for tall growing, old-fashioned flowers, such as hollyhocks. One can imagine such a garden with beds of pinks, heliotrope, petunias, and mignonette. A back gate framed and covered with one of our many beautiful flowering creepers would make a pleasing picture from the roadway and grounds.

The joy of a home with a garden is found in watching its development and growth to a state of perfection; be it just a home surrounded by grass and shrubs, or by a garden full of gorgeous blooms. Sunlight and shade, bright flowers against dark foliage, curving paths and shrubs, quiet corners with garden seats all gain added beauty from each other. Do not let the seasons pass without erecting in your garden some feature from which it will gain individuality and restfulness.

\*In the Brisbane "Sunday Mail."



PLATE 146.

This fibrolite bungalow was one of the most interesting exhibits at the recent Brisbane Show, and was a centre of attraction. It embodied many modern features, including rough-cast exterior walls, a variety of artistic interior treatments, and new panel suggestions and wall-paper effects.

### VEGETABLES.

Vegetables will require constant attention in the Granite Belt area. Tomatoes and potatoes will require to be carefully watched in order to prevent loss from Irish blight, and no time should be lost in spraying these crops should this disease make its appearance in any part of the district, as it can be prevented by spraying with either Bordeaux or Burgundy mixture. These fungicides effectually protect the plants to which they are applied if used in time. If leaf-eating insects, such as beetles, grasshoppers, and caterpillars, are doing damage as well, add 3 or 4 lb. of arsenate of lead to the 100 gallons of spraying mixture used for the prevention of early and late blight (potato macrosporium and Irish blight), so that the one application will be effectual for both classes of diseases.

Keep all kinds of vegetables well worked, stirring the land frequently to retain moisture, and taking care to prevent the formation of a surface crust should rain fall. Remember that vegetables require plenty of moisture; therefore leave nothing to chance, but do your best to retain all the moisture in the soil you possibly can.

## Farm Notes for December.

Although November is regarded generally as the best period for planting the main maize crop, on account of the tasseling period harmonising later on with the summer rains, December planting may be carried out in districts where early frosts are not prevalent, provided a known quick maturing variety of maize is sown.

To ensure a supply of late autumn and winter feed, dairymen are advised to make successive sowings of maize and sorghums, to be ultimately used either as green feed or in the form of silage. The necessity for such provision cannot be too strongly urged. Farmers who have not had any experience in building an ensilage stack can rest assured that, if they produce a crop for this purpose, information and instruction on the matter will be given on application to the Under Secretary for Agriculture and Stock; also that, whenever possible, the services of an instructor will be made available for carrying out a demonstration in ensilage-making for the benefit of the farmer concerned and his immediate neighbours.

In districts and localities where supplies of lucerne are not available, sowings of cowpeas should be made, particularly by dairymen, as the lack of protein-yielding foods for milch cows is a common cause of diminished milk supplies and of unthriftiness of animals in dairy herds. Cowpeas and lucerne can be depended upon to supply the deficiency. The former crop is hardy and drought-resisting. When plants are

to be used as fodder, it is customary to commence to feed them to stock when the pods have formed. Animals are not fond of cowpeas in a fresh, green state, consequently the plants should be cut a day or two before use. Economy is effected by chaffing beforehand, but the plants can also be fed whole. Chaffed in the manner indicated, and fed in conjunction with green maize, or sorghum, when in head, in the proportion of one-third of the former to two-thirds of the latter, a well-balanced ration is obtainable. Animals with access to grass land will consume from 40 to 50 lb. per head per day; a good increase in the milk flow is promoted by this succulent diet. The plant has other excellent attributes as a soil renovator. Pig-raisers will find it invaluable also.

A great variety of quick-growing catch crops, suitable for green fodder and ensilage purposes, may also be sown this month, notably Sudan grass, white panicum, giant panicum (liberty millet), Japanese millet, red and white French millet. Well prepared land, however, is required for crops of this description, which make their growth within a very limited period of time. French millet is particularly valuable as a birdseed crop, the white variety being more in favour for this purpose.

Successive sowings may be made of pumpkins, melons, and plants of this description.

In districts where onions are grown, these will now be ready for harvesting. If attention is given, in the case of garden plots, to bending over the tops of the onions, maturity of the crop is hastened. Evidence will be shown of the natural ripening-off process, and steps should be taken to lift the bulbs and to place them in windows until the tops are dry enough to twist off. If a ready market is not available, and it is decided to hold over the onions for a time, special care should be taken in handling. Storage in racks in a cool barn is necessary; otherwise considerable deterioration is to be expected. Improved prices are to be looked for in marketing by grading and classifying produce of this description.

Cotton areas which were subjected to a thorough initial preparation, thereby conserving a sufficiency of moisture for the young plants, should now be making good headway and sending their taproots well down. Keep down all weed growth by scarifying as long as the growth will admit of horse work.

## Orchard Notes for December.

### THE COASTAL DISTRICTS.

The planting of pineapples and bananas may be continued, taking care that the ground is properly prepared and suckers carefully selected, as advised previously in these Notes. Keep the plantations well worked and free from weeds of all kinds, especially if the season is dry. New plantations require constant attention, in order to give young plants every chance to get a good start; if checked when young they take a long time to pull up and the fruiting period is considerably retarded. Small areas well worked are more profitable than large areas indifferently looked after, as the fruit they produce is of very much better quality. This is a very important matter in the case of both of these fruits, as with the great increase in the area under crop there is not likely to be a profitable market for inferior fruit. Cannors only want first-class pines of a size that will fill a can, and cannot utilise small or inferior fruit, except in very limited quantities, and even then at a very low price. Small, badly filled bananas are always hard to quit, and with a well-supplied market they become unsaleable. Pineapple growers, especially those who have a quantity of the Ripley Queen variety, are warned that the sending of very immature fruit to the Southern markets is most unwise, as there is no surer way of spoiling the market for the main crop. Immature pineapples are not fit for human consumption, and should be condemned by the health authorities of the States to which they are sent.

Citrus orchards require constant attention; the land must be kept well worked and all weed growth destroyed. Spraying or cyaniding for scale insects should be carried out where necessary. Spraying with fungicides should be done where the trees show the need of it. A close lookout must be kept for the first indications of "maori," and as soon as it is discovered the trees should either be dusted with dry sulphur or sprayed with the lime-sulphur, potassium, or sodium sulphide washes. Borer should be looked for and destroyed whenever seen.

Early grapes will be ready for cutting. Handle carefully, and get them on to the market in the best possible condition. A bunch with the bloom on and every

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MRS. R. WILKS—Golden Yellow.  
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berry perfect will always look and sell well, even on a full market, when crushed and ill-packed lines are hard to quit.

Peaches, plums, papaws, and melons will be in season during the month. See that they are properly handled. Look out for fruit fly in all early ripening stone fruit, and see that none is left to lie under the trees to rot and thus breed a big crop of flies to destroy the mango crop when it ripens.

Keep leaf-eating insects of all kinds in check by spraying the plants on which they feed with arsenate of lead.

Look out for Irish blight in potatoes and tomatoes, and mildew on melons and kindred plants. Use Bordeaux or Burgundy mixture for the former, and finely ground sulphur or a sulphide spray for the latter.

## THE GRANITE BELT, SOUTHERN AND CENTRAL TABLELANDS.

Early ripening apples, plums, apricots, peaches, and nectarines will be ready for marketing during the month. They are unsatisfactory lines to handle, as the old saw, "Early ripe, early rotten," applies to all of them; in fact, the season of any particular variety is so short that it must be marketed and consumed as quickly as possible. All early ripening deciduous fruits are poor carriers and bad keepers, as their flesh is soft and watery, deficient in firmness and sugar, and cannot, therefore, be sent to any distant market. The available markets are quickly over-supplied with this class of fruit, and a glut takes place in consequence. Merchants frequently make the serious mistake of trying to hold such fruits, in the hope of the market improving, with the result that, instead of improving, the market frequently becomes more and more congested, and held-over lines have to be sent to the tip. There is only one way to deal with this class of fruit, and that is to clear the markets daily, no matter what the price, and get it distributed and into consumption as rapidly as possible by means of barrowmen and hawkers. Most early ripening fruits are useless for preserving in any way, their only value being what they will bring for consumption whilst fresh. This being so, it is only a waste of time and money to forward immature, undersized, and inferior fruit to market, as it is not wanted, and there is no sale for it. It should never have been grown, as it is frequently only an expense to the producer, besides which, unless the fallen or over-ripe fruit is regularly and systematically gathered and destroyed in the orchard, it becomes a breeding ground for fruit fly and codlin moth, as well as of fungi, such as those producing the brown and ripe rots. Early ripening fruits should, therefore, be carefully graded for size and quality, handled, and packed with great care, and nothing but choice fruit sent to market. If this is done, a good price will be secured, but if the whole crop—good, bad, and indifferent—is rushed on to the local markets, a serious congestion is bound to take place and large quantities will go to waste.

Orchards and vineyards must be kept in a state of perfect tilth, especially if the weather is dry, so as to retain the moisture necessary for the development of the later ripening fruits. Where citrus fruits are grown, an irrigation should be given during the month if water is available for this purpose, excepting, of course, there is a good fall of rain sufficient to provide an ample supply of moisture.

Codlin moth and fruit fly must receive constant attention and be kept under control, otherwise the later-ripening fruits are likely to suffer severely from the depredations of these serious pests.

Grape vines must be carefully attended to and sprayed where necessary for black spot or downy mildew, or sulphured for oidium. Where brown rot makes its appearance, spraying with the potassium or sodium sulphide washes should be carried out. Leaf-eating insects of all kinds can be kept in check by spraying with arsenate of lead.

### INSPIRED BY THE JOURNAL.

*A North Arm farmer, renewing his subscription for a further three years, writes (4th September, 1928)—"At the same time I would like to express the joy and inspiration I receive with each number, and trust its circulation is being continually extended amongst those who, like me, can appreciate it."*

**ASTRONOMICAL DATA FOR QUEENSLAND.**

TIMES COMPUTED BY D. EGLINTON, F.R.A.S., AND A. C. EGLINTON.

**TIMES OF SUNRISE, SUNSET, AND MOONRISE.****AT WARWICK.**

Date.	November, 1928.		December, 1928.		MOONRISE.	
	Rises.	Sets.	Rises.	Sets.	Rises.	Sets.
1	5.3	6.9	4.50	6.32	10.9	p.m. 10.44
2	5.2	6.10	4.50	6.32	11.12	11.30
3	5.1	6.11	4.50	6.33	...	...
4	5.0	6.11	4.50	6.34	12.10	a.m. 12.8
5	5.0	6.12	4.50	6.35	1.1	12.41
6	4.50	6.13	4.50	6.35	1.42	1.12
7	4.58	6.13	4.50	6.36	2.17	1.42
8	4.57	6.14	4.50	6.36	2.49	2.12
9	4.57	6.15	4.50	6.37	3.19	2.41
10	4.56	6.15	4.51	6.38	3.48	3.15
11	4.56	6.16	4.51	6.39	4.19	3.48
12	4.55	6.17	4.51	6.40	4.49	4.28
13	4.55	6.18	4.51	6.40	5.21	5.14
14	4.54	6.18	4.52	6.41	5.58	6.3
15	4.54	6.19	4.52	6.41	6.40	6.56
16	4.53	6.20	4.52	6.42	7.27	7.50
17	4.53	6.21	4.52	6.43	8.17	8.46
18	4.53	6.21	4.53	6.43	9.10	9.46
19	4.52	6.22	4.53	6.44	10.6	10.43
20	4.52	6.23	4.54	6.44	11.4	11.49
21	4.51	6.24	4.54	6.45	12.3	p.m. 12.40
22	4.51	6.25	4.55	6.46	1.3	1.42
23	4.51	6.26	4.55	6.46	2.4	2.47
24	4.51	6.27	4.56	6.47	3.6	3.55
25	4.51	6.28	4.56	6.47	4.12	5.8
26	4.50	6.29	4.57	6.47	5.20	6.17
27	4.50	6.29	4.57	6.48	6.33	7.24
28	4.50	6.30	4.58	6.48	7.37	8.26
29	4.50	6.31	4.59	6.48	8.54	9.19
30	4.50	6.31	5.0	6.49	9.58	10.2
31	...	...	5.0	6.49	...	10.40

**Phases of the Moon, Occultations, &c.**

The times stated are for Queensland, New South Wales, Victoria, and Tasmania.

5 Nov.	▷ Last Quarter	12 6 a.m.
12 "	● New Moon	7 35 p.m.
20 "	◐ First Quarter	11 35 p.m.
27 "	○ Full Moon	7 5 p.m.

Apogee, 14th November, at 6.6 p.m.

Perigee, 27th November, at 11.30 p.m.

The nearness of Venus to Saturn on the 6th, 7th, and 8th will be interesting to notice between 7 and 8 p.m. a little before they set.

While the Sun is partially eclipsed on the 12th at Madras and many other places in Asia as well as in Europe, including the British Isles, it will be serenely shining here, unaffected by the Moon, which, however, will be remarkably near the line joining the Earth and Sun.

Unfortunately the occultation of Venus by the Moon on the 15th will be unobservable throughout Queensland. Had the time been a few hours earlier it would have been a highly interesting spectacle.

Jupiter will be occulted at Sydney and Melbourne on the afternoon of the 25th, but this interesting sight will be unobservable in Queensland.

On 27th November the Moon will rise completely enshrouded in the shadow of the Earth and therefore entirely cut off from the direct rays of the Sun. From the commencement of totality at 6.33 p.m., for 56 minutes, the Moon will be eclipsed. From 7.39 to 8.39 it will be slowly recovering its usual brightness and will pass through all the phases from new to full in seventy minutes, but will still be in the penumbra or fainter part of the earth's shadow till 9.37; after which it will occult two stars in Taurus, Kappa, and Epsilon. It will be interesting to observers to notice how Kappa will be so close to the southern edge of the Moon as to be occulted for a few minutes only.

The conjunction of Mars with the Moon at 10 p.m. on the 29th will be an interesting sight throughout Australia as Mars will be remarkably near the southern edge of the Moon. In the northern half of China, Mars will be occulted.

The two finest planets, Venus and Jupiter, will be evening stars; Venus in the west, apparently in the constellation Ophiuchus from the 1st to the 15th, and after that in Sagittarius. Jupiter will be in the east and apparently moving slowly backwards amongst the Stars of Aries.

Mercury, in Virgo, near Spica, will rise 42 minutes before the Sun on the 1st; on the 15th it will be in Libra and rise 52 minutes before the Sun.

Saturn will be in the western sky, setting nearly an hour before Venus on the 15th.

4 Dec.	▷ Last Quarter	12 31 p.m.
12 "	● New Moon	3 6 p.m.
20 "	◐ First Quarter	1 43 p.m.
27 "	○ Full Moon	5 54 a.m.

Apogee, 11th December, at 7 18 p.m.

Perigee, 26th December, at 12 30 p.m.

For places west of Warwick and nearly in the same latitude, 28 degrees 12 minutes S., add 4 minutes for each degree of longitude. For example, at Inglewood, add 4 minutes to the times given above for Warwick; at Goondiwindi, add 8 minutes; at St. George, 14 minutes; at Cunnamulla, 25 minutes; at Thargomindah, 33 minutes; and at Oontoo, 43 minutes.

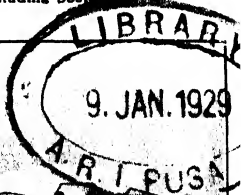
The moonlight nights for each month can best be ascertained by noticing the dates when the moon will be in the first quarter and when full. In the latter case the moon will rise somewhat about the time the sun sets, and the moonlight then extends all through the night; when at the first quarter the moon rises somewhere about six hours before the sun sets, and it is moonlight only till about midnight. After full moon it will be later each evening before it rises, and when in the last quarter it will not generally rise till after midnight.

It must be remembered that the times referred to are only roughly approximate, as the relative positions of the sun and moon vary considerably.

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# QUEENSLAND AGRICULTURAL JOURNAL

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PART 6

## Event and Comment.

### Benefits of Organised Marketing.

**I**N his report to the Minister for Agriculture (Mr. W. Forgan Smith), the Director of Marketing (Mr. L. R. Macgregor) says that with organised marketing supply can be measurably controlled, demand stimulated, and new markets developed, but complete price stabilisation is difficult of attainment. Economic and climatic influences so operate that even with complete control of a commodity, prices at times must fall, and the primary producer suffers as a result. It appears, however, to be unquestionable that some Queensland agricultural industries would be non-existent but for collective marketing, and all which are subject to control have been materially benefited. There is an increasing support of organised marketing among Queensland primary producers generally. So far there is every indication that the system of collective marketing has become an integral feature of Queensland agriculture.

### Objective of Agricultural Organisation.

**T**HE Queensland plan of agricultural organisation dates from the year 1922. In that year comprehensive organisation of farmers was provided for, and the support by the farmers throughout the State of the principle of organisation was enlisted by the establishment of over 700 local producers' associations. The objective was to encourage farmers to co-operate in all matters pertaining to agricultural well-being. The improvement of marketing conditions was adopted as the immediate objective, and in the attainment of which the support of the rank and file of the primary producers was necessary. The objective of organised marketing was adopted, not because that is the only sphere in which farmer organisation can bring benefits to

the farmers, but because it was the sphere in which the advantage of unity of purpose in the attainment of a common object was felt to be most readily demonstrable. Further, it was foreseen to be the objective for which the support of the agriculturists themselves would most readily be forthcoming.

### **Widespread Character of Controlled Marketing.**

**A**T this time last year thirteen of the main primary products of the State were being marketed under organisation, and that is the position at present. Taking the annual value of the agricultural production of Queensland and reckoning the products which are subject to the system of controlled marketing, it may be said that approximately three-fourths of the annual value of the State's production have been brought under the system.

### **The Poultry Industry.**

**T**HE marketing of eggs is fraught with especial difficulties in excess of those which apply in the case of most primary products. The Egg Board's problems are greater than those of any other commodity board. Following are some points in connection with this matter:—

(1) The product is highly perishable and, although there are peaks and depressions in production, it is nevertheless more or less continuous. In fruit, which is another perishable product, there is a seasonal production, but in the case of eggs there is no period in which the production drops to nil.

(2) For a good many years the production of eggs in Queensland has been in excess of local demand. During the past financial year production has increased by 20 per cent., necessitating an increased utilisation of interstate and overseas markets with resultant costs. As a consequence of such increasing production, the endeavours of the Board and its agents have been severely taxed to hold the market.

The Egg Board is concentrating upon an endeavour to reduce the variation of price that exists as between the period of short supply and of flush production. The Board realises that there would be a greatly increased consumption of eggs on the local market if the price could be prevented from rising to the high figure of 2s. 10d., at which price it is impossible for many consumers to buy. A stabilised price would level up consumption on the local market to higher figures all the year round. The Board is seeking to restrict variations in price, but the increasing production of eggs is proving a serious handicap.

### **Canary Seed.**

**T**HE market conditions for canary seed this season have been singularly unfortunate. Shortly after the inception of the Canary Seed Board there was a fall in world values to £16 10s. per ton for Argentine seed on 15th March. Imported canary seed was offered at that figure by importers at a uniform price at all Australian ports. The Board was forced into the position of having to consider meeting the competition of the imported article, or, in the alternative, of holding seed indefinitely for higher values. Merchants had the opportunity through the importers of booking up imported seed at the low values ruling in the month of March for spread delivery during the ensuing months. If, therefore, the Board had not met this competition its market would have been cut off for months ahead owing to the bookings by merchants of imported seed. The holding of the seed would have necessitated the Board incurring storage and interest charges for at least a year, with no certainty then that the market would have improved by that time. It was therefore decided to sell canary seed competitively with the imported article. The only advantages, therefore, which the producers have had through the Canary Seed Pool this season are—

- (a) The full advantage of the protective duty of £8 8s. per ton.
- (b) The advantage of the cleaning and treatment of the seed at rates cheaper than would have been available to the individual.
- (c) The price has been held at import parity, notwithstanding considerable importations; whereas in the absence of a pool, if merchants had been fully booked up with the imported article, the probability is that the local production (without control of the market) would have fallen to less than import values.

### The Peanut Industry.

**T**HIS industry continues to develop. Up to the present time, pending treatment and sale, the nuts have been stored at farmers' barns and various other unsuitable locations, and, as a consequence, consideration has been given to the erection of a modern storage and treatment plant. This plant is now in course of construction, and it is estimated that it will be completed in the beginning of 1929, and that it will be available for next season's crop. The plant will enable the more economical handling of the product. It will also make safe storage available, and improve the grade of the product placed on the market.

### Production Problems in the Dairying Industry.

**W**ITH the apparent return of more favourable climatic conditions, a focussing by the dairying executives of the attention of their constituents to production problems is urgently desirable. It is not yet fully appreciated by dairymen that an increase in the production per cow is capable of exerting more direct influence in increasing their monetary return from the product than is readily attainable by an artificial raising of price, so long as export exceeds local consumption. This is more noteworthy as regards Queensland than in the case of any other Australian State. Even if the objective of an all-Australian price is attained, dairymen, in a State such as Queensland which exports annually about two-thirds of its production, will always be handicapped in comparison with dairymen in a State like New South Wales which consumes most of its own production.

The objective of increased production per cow may be gradually attained by the application to production problems of the same enterprise and vigorous organisation methods as have been manifested by Queensland producer leaders in co-operative manufacture and marketing, and in particular by the application of these methods to—

- (1) The undertaking by L.P.A.'s in dairying districts of herd testing.
- (2) Rigorous culling of unproductive cows.
- (3) The use by producers of the facilities which exist whereby dairymen may secure bulls of high producing strains, including the Departmental Better Bull Scheme.

It is admitted that bad seasons are discouraging to dairymen taking active steps in the directions indicated, but the return of good seasons renders it timely for L.P.A.'s in dairying districts to encourage their members along these lines.

### Deciduous Fruit.

**T**HE position of the deciduous fruit industry as engaged in largely in the Stanthorpe district has been carefully reviewed during the past year. Some points in connection with the matter are:—

(1) The total number of packages sent from Stanthorpe to Brisbane for the 1928 season was 649,838, as against 450,837 for the year 1927, the average number of packages per Stanthorpe grower being 1,000 for approximately 700 growers.

(2) There has been considerable development in the despatch of quantities direct from Stanthorpe to the provincial centres.

(3) Deciduous fruits for factory purposes were formerly purchased haphazardly, some being despatched direct from grower's station to factory, but a considerable quantity was purchased from the market. Second-grade fruit is suitable for manufacturers' requirements, and a freeing of the fresh fruit market of the second-grade fruit in question automatically improves the market for the better quality fruits.

(4) The quantity sent direct to factory in previous years was a fraction only of 1 per cent. Last year the quantity sent direct to the factory was 6 per cent. of the total, the figures being—

	Tons.									
Direct to fresh fruit market	..	..	..	..	..	..	..	..	..	10,969
Direct to factory	..	..	..	..	..	..	..	..	..	698
Total	..	..	..	..	..	..	..	..	..	11,667

Thus it seems possible to increase the proportion sent direct to the factory to probably 10 per cent. It is important to note that the fruit sent direct to factory is the second grade, which exercises the greatest depressing effect on the market. Further, a surplus of 10 per cent. will frequently depress the market out of all proportion. The market, therefore, is being relieved to a greater extent than the percentage actually shows.

## Bureau of Sugar Experiment Stations.

### BIOLOGICAL CONTROL OF CATERPILLARS ATTACKING SUGAR CANE.

Mr. E. Jarvis, Entomologist at Meringa, near Cairns, has submitted the following report for the period, October to November, 1928, to the Director of the Bureau of Sugar Experiment Stations:—

Amongst the numerous natural enemies belonging to class Insecta, which wage perpetual warfare against the caterpillars of various species of the order Lepidoptera, a few of the so-called "ground beetles" (Carabidæ) occurring commonly in our cane-fields happen to be of decided economic interest.

About a couple of months ago (15th September) the present writer confined a specimen of *Rhytisternus carpentarius* S. in a small breeding-cage, in order to make a preliminary study of its range of dietary whilst under confinement. This carab measures about 18 mm. in length (nearly three-quarters of an inch), and in general appearance is lustrous black, with exception of the antennæ and tarsi which are dark reddish, the latter being provided with stiff hairs. The upper surface of the body is flattened, the elytra having about twelve decided dorsal striæ, and about three striations on the sides of each elytron.

At intervals of from four to seven days the following miscellaneous insects were killed by and greedily devoured by this predaceous beetle—viz., two large sarcophagid flies; a caterpillar of *Cirphis unipuncta* Haw. ("Army Worm"), about 1½ inches long; a grub of *Isodon puncticollis* MacI. in the third instar; a pupa of *Dichocrocis punctiferalis*, "Peach Borer"; two cockroaches, *Periplaneta americana*, and a smaller arboreal species; and a caterpillar of *Laphygma exempta* Walk.

Each of these insects was put into the cage during the afternoon, at which time the beetle was hidden in the soil under a stone, and was usually found to have disappeared by the next morning. The harder chitinous portions, such as the head and mandibles of larvæ and wings and elytra of the dipterous and orthopterous insects respectively, were invariably rejected.

Perhaps our most useful species of "ground beetle" will prove to be *Chlaenius australis* Dej., some of the predatory habits of which were recorded by the writer for the first time in the year 1921 ("Queensland Agricultural Journal," vol. xvi., p. 278). Both the adult and larval forms of this insect were observed destroying caterpillars of the "grass worm" *Laphygma exempta* Walk., which during February of 1920 inflicted great damage to the leaves of young cane and maize plants at Meringa, near Cairns.

These predaceous larvæ occurred quite commonly in this affected area, attacking principally the caterpillars traversing the bare ground between cane rows, but also exploring the leaves in search of prey. Upon encountering a caterpillar the predator instantly buried its powerful cutting mandibles deeply in the body, near the head, and then simply hung on, while the unfortunate victim vainly endeavoured to shake off its foe, twisted and rapidly rolled over and over convulsively. Such struggles seldom lasted more than a minute, at the end of which time even large caterpillars seemed too weak to offer further resistance, and suffered the enemy to greedily imbibe their life juices until its body had become greatly swollen and could hold no more.

The larvæ of *C. australis* run with agility, being exceedingly active and pugnacious. When alarmed, they hide in small holes or sun-cracks in the dry earth. Specimens captured in the field and fed upon noctuid larvæ and pupæ pupated at the bottom of breeding-cages under damp soil. The pupal condition during March (one of our hottest months) lasted only seven days; the mean shade maximum temperature at the time being about 87 deg. Fahr.

Scientific descriptions of the larval and pupal stages of this beetle need not be given here, but I may state that in general appearance the larva is uniformly black, of typical campodeoid form, and slightly exceeds half an inch in length. This beetle is about 15 mm. long, with pronotum and head shining green and deeply punctulate; wing-cases dark brown, edged with green, and often suffused with iridescent pink; each elytron with eight parallel rows of punctures. Legs and ventral surface of body shining black; palpi and basal joints of antennæ reddish-brown.

In a paper dealing with the "Economic Value of Certain Queensland Parasitic Insects," contributed to the Pan-Pacific Congress held in Sydney during August, 1923 ("Queensland Agricultural Journal," vol. xxii., p. 115), the present writer advocated the introduction of this useful predator into other countries desirous of enlisting its services in connection with biological control work.

It is of interest to note that during 1919 a species of *Chlaenius* (probably *C. australis* Dej.) was introduced into Hawaii from North Queensland by the Sugar Planters' Association; presumably for the purpose of combating army worms. Several species of this useful genus of Carabidæ perform valuable services in other parts of the world against various lepidopterous insect pests. *Chlaenius tomentosus* Say., for example, helps to control the ravages of the so-called "Tobacco wire worm" (*Crambus caliginocellus* Clem.) in Virginia, and is believed also to be predaceous on the grubs of *Lachnosterna* in North America; while *Chlaenius dichrous* destroys caterpillars of the familiar "Codling Moth" (*Cydia pomonella*) in South Africa.

In addition to *C. australis*, alluded to above, two other species of this genus are not uncommon here in canefields, viz., *C. flavipunctatus* Mael. and *C. ophonoides* Fairm., both of which should be protected by the grower when noticed in plough furrows.

*Enigma cyaneum* Cast. is another of our farmers' friends, and may be easily distinguished from the foregoing species by its lovely bright blue wing-cases. The metamorphosis of this beetle is being studied at present at Meringa Experiment Station.

### **Emergence of Greyback Cockchafers.**

The month of October was a very dry one, our registration at Meringa Experiment Station being eleven points, instead of 1.84 inches, which is the average rainfall for the Cairns district for this month during the last forty-five years. November, however, saw a change in the weather, and up to date (14th November) we have recorded 8.93 inches at Meringa. This welcome rain was accompanied by much cooler conditions, the mean shade maximum temperature during the period 11th to 14th November being 81.75 deg. Fahr., while our average for the entire preceding month (October) was 91.6 Fahr. It is interesting to note that the latter temperature was unusually high for October, seeing that our average for this month during the last five years happens to be 87.92 deg. Fahr.

A few odd specimens of greyback cane beetles have already appeared on the wing, the earliest capture recorded being on 4th November. Up to the present, however, the main body is still below the ground, but may be expected to emerge directly weather conditions favour commencement of the flying period.

## **RELATIONSHIP BETWEEN INSECT ATTACK AND PLANT FAILURE**

The Southern Assistant Entomologist, Mr. R. W. Montgomery, has submitted the following report for the period October to November, 1928, to the Director of the Bureau of Sugar Experiment Stations, Mr. H. T. Easterby:—

Generally speaking, cane which has been planted in spring is, to a greater extent, more subject to the attacks of insect pests than autumn-planted cane. This condition is applicable to the Southern part of Queensland, where these two distinct planting seasons are chiefly recognised. This state of affairs is not to be wondered at when it is remembered that spring represents the time when practically the whole insect world is waking from a period of dormancy, and when new insects are hatching out and entering on a period of activity, all intent on feeding and a consequent destruction of our crops. In the autumn months most of the insects are preparing for their dormant winter period, or at least a period of decreasing activity; accordingly insect damage from then onwards throughout the winter is on the wane.

The most important insects known to attack cane sets are the various species of cane grubs (*Scarabæidæ*), wireworms (*Elateridæ*), mole-crickets (*Gryllotalpa* sp.), plant-eating beetles (*Rhyparida* sp.), soldier fly larvae (*Stratiomyidæ*), and others, each of which is known to do serious damage in certain areas. With this long region of foes arrayed against the grower at planting time, it would seem that his chances of obtaining a successful strike are somewhat meagre. Happily for him, some of these are so restricted in their choice of certain types of soils, moisture conditions, &c., and exhibit such partiality for certain plants which serve them as food, that seldom do more than one of these major pests occur in any one field.

at the same time. Further, by taking pains in the preparation of his land previous to planting, and by cleaning up all waste and neglected areas, which form what one might almost term sanctuaries where pests may breed unmolested, he is ridding his farm of possible sources whence an insect attack may originate, and in so doing he is greatly increasing his chances of obtaining a regular stand of cane in his plant crop.

Notwithstanding, as previously pointed out, the number of pests that may beset the farmer at planting time, the writer is of the opinion that in many cases insect damage to newly planted sets is greatly exaggerated, and in the majority of cases so quoted, failure to secure a good strike is due chiefly to the lack of attention paid to the details of plant selection and to the actual cutting of the plants themselves. A case in point occurred quite recently when we were called on to investigate the failure of a certain field of cane, which the farmer wrongly attributed to insect attack. When this matter was investigated, it was found that the plants he had been using were from 2 to 4 inches in length showing one to two eyes only, which practice shows a lack of knowledge of the general principles of sugar-cane growing. The practice of planting three-eyed plants is now almost universally favoured, and plants should not be cut less than about 9 inches in length, despite the fact that more than three eyes may be included in this length of cane. In exceptional cases of canes with long internodes, two-eye plants may have to be used to enable the plant to pass through the planter chute, but such instances are comparatively rare. Obviously, in the case under consideration three-eyed plants should have been used, and if this had been done a high percentage strike would have been assured, for the forest land on which this failure happened, was, at the time of our investigations, carrying a fair moisture content. Small sets may strike and grow well in wet situations, but as soon as drought conditions prevail for any length of time the resulting plants are the first to wilt and die. Then, some insects such as our common brown ant (*Pheidole proxima* Mayr.) may take up their abode in these old dried-out cane sets, and are frequently credited with being the primary factors in the death of that set, whereas their presence there is chiefly secondary.

Again, the peculiar tendency which certain varieties have when grown under cold and wet conditions, of "bleeding" when cut early in the season, and later, failing to ratoon, has frequently earned evil reputations for many insects which happen to be present in that particular field. Such reputations are no doubt undeserved since they may or may not in any way be associated with sugar-cane as a source of food supply.

Fortunately, the cases cited above are not frequent, but are typical of a few that are met with from time to time. Information on subjects which involve such questions as cane cultivation can be readily obtained from the Field Assistant who pays periodical visits to the various sugar-growing centres.

## GREEN MANURES FOR CANE CROPS.

By H. T. EASTERBY, Director of Sugar Experiment Stations.

THE practice of growing green crops, especially leguminous plants, is one that can be strongly advocated in cane cultivation. Cane-growers frequently ask for information as to the best seed to use, and the quantity per acre, and it is thought that a short article would be of assistance to growers.

Shortly summarised, green manures increase the warmth and better the texture of the soil, and such crops are generally looked upon as increasing the humus content. Other advantages are—

- (1) During growth the ground is shaded and moisture is conserved.
- (2) Erosion of fine earth is prevented during heavy rains.
- (3) Weed killing is promoted.
- (4) The deep tap roots of leguminous plants bring available plant food from the subsoil to the surface soil.
- (5) The interposition of a crop other than cane acts in minimising diseases and insect attacks.
- (6) Any form of crop rotation is an excellent one to practice.

Nitrogen is the soil element that becomes the most quickly exhausted, and is also the element that is the most expensive to purchase. Under favourable conditions the nodules upon the roots of leguminous crops contain countless thousands of

bacteria which seize the nitrogen from the air. It is possible to add from 100 to 200 lb. of nitrogen per acre.

The best forms of green manure to use for cane are cowpeas and Mauritius bean. These can generally be procured at any large seedsman's, but the price varies from year to year according to the supply. If there were a regular demand for green manure there is no doubt that farmers in the Southern part of the State would cater for the supply, but the demand is not nearly so great as it should be, and consequently farmers who grow this crop for seed are few and far between.

Green manure seed is generally sown broadcast at the rate of one bushel per acre. If it is drilled in, 20 lb. per acre are usually sufficient when the drills are spaced 18 inches to 2 feet apart. In Northern sugar areas it is generally sown broadcast, while in the South it is generally drilled. The best time to sow green manure seed is from October to the end of December—November is probably the best month. In sowing broadcast it is generally sufficient to harrow the seed in, but in any case the seed should not be planted more than an inch to a inch and a-half. It is a wise practice to sow after rain.

Cowpea usually flowers in from two to three months if conditions have been favourable, but Mauritius bean takes as long as five months, but usually makes a heavier crop. The best time to plough in green crops is at the time the seed in the pods is in a milky condition. Some difficulty may be experienced in ploughing in a heavy crop of green manure, but by first rolling, then disc harrowing, and finally using the plough with a large disc, it becomes an easy matter to cover the crop. Generally speaking, it takes from six to eight weeks for the crop to rot down. If this has taken place and the time is convenient, the ground can be got ready for the succeeding cane crop.

The following are analyses made of cowpea and Mauritius bean:—

Variety.	Pounds per Acre.			
	Nitrogen.	Phosphoric Acid.	Lime.	Potash.
Cowpea .. .. .	151	35	..	96
Mauritius Bean .. .	173	40	317	141

### CANE GRUB ACTIVITY.

*The Southern Assistant Entomologist (Mr. R. W. Mungomery) has furnished the following report for the period 15th September to 15th October, to the Director of the Bureau of Sugar Experiment Stations, Mr. H. T. Easterby:—*

October is the month when grub damage in the South is likely to become very noticeable, and growers should keep a sharp watch for the first signs of their activities. The dry weather conditions which are now prevailing will help to reveal their presence, for it is well known that grubs have a greater effect on a cane stool during a dry period than during a wet period. Cane stools at which grubs are feeding are characterised by the outer leaves of individual sticks assuming a sickly yellowish appearance, while the central spindles, though green, show a decided wilt, which is unnatural with healthy growing cane. Bandicoot burrows around a stool of cane often furnish additional proof of grubs being present.

When the grower has satisfied himself that grubs are present, fumigation should be resorted to as soon as possible, and provided that the rooting system of the stool is not too badly damaged there is every reason to hope that it will recover sufficiently to produce a fair crop, but it is almost futile to wait until the young leaves are quite dry and the plant almost dead before fumigating, and then to expect a crop.

If grub damage shows up in the spring months, paradichlorobenzene can be used with good results. Care should be taken that this fumigant is not injected too deeply into the ground, otherwise it will not evaporate sufficiently to produce a high mortality, and 2-3 inches will prove a sufficient depth in the Bundaberg and Isis districts at which to bury these crystals. Paradichlor. has the property of giving

off toxic vapours for a considerable time, and this is a distinct advantage when we take into consideration the habits of our injurious scarabæid grubs. The majority of these grubs remain in the second stage throughout the winter months and assume their third stage in the spring. Soon after this last moult they usually rise towards the surface and recommence feeding at the cane roots. Now, as there is a marked overlapping of the second and third stages, it will be apparent that there may be differences as great as a month or more in the times at which different grubs resume feeding, hence paradichlor. is particularly suited to be used as a fumigant in such cases, for when each successive grub comes to feed at the stool and likewise comes within the effective radius, it is either killed or the fumigant may act as a repellent and drive it away.

### Carbon Bisulphide as a Fumigant.

Carbon bisulphide, when injected in the soil, though quicker acting than paradichlor., and killing the grubs in a much shorter period, does not possess the property of remaining toxic over a number of days, and therefore would fail to kill those grubs which rise towards the surface subsequent to the act of fumigation. Later on in the year, towards December, when in the ordinary course of events thunderstorms have occurred from time to time and the soil is in a fairly moist condition, grubs for the most part will be found feeding near the surface (say within the first 8 inches of soil) and then the use of carbon bisulphide is to be recommended in preference to paradichlor. Used in sandy loam forest soil against third-stage "*trichosterna*" grubs last December, a mortality of almost 100 per cent. was obtained.

With paradichlor. injected at the same time, the difference was very apparent. Soon after applying the fumigants heavy rains were experienced and in a month's time no mortality had taken place amongst those grubs which were subjected to this latter fumigation, and the cane had suffered quite as much damage as that in the untreated rows. Later, however, after an interval of fine hot weather, the treated rows began to look very much greener, and healthy suckers came away from the stools. This plot then stood out in sharp contrast to the untreated rows which had been almost entirely killed. On closer investigation it was seen that the majority of the grubs had stopped feeding and were in a semi-paralysed condition. Succeeding rains accompanied by a reduction in temperature soon prevented further evaporation of the paradichlor. crystals, enabling the grubs to recover. They have since been watched with considerable interest, and recent diggings revealed the fact that they had pupated successfully. On account of this and similar past experience, the use of paradichlor. against large third-stage grubs is not advocated when the monsoonal season is imminent, carbon bisulphide being cheaper, easier to apply, and giving a higher mortality.

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## ENTOMOLOGICAL HINTS TO CANEGROWERS.

By EDMUND JARVIS.

### Weather.

Very dry conditions have been experienced during the last twelve months, dating from August, 1927, to July, 1928; the rainfall for which period has been 49.20 inches, or 42.24 inches less than the average annual precipitation for the district of Cairns; while the fall during June to October of last year (1927) happened to be 163 points less than the average for these five months of the year.

### Don't Forget the Date on which Greybacks Appear on the Wing.

Growers would do well to make a note of the date on which these beetles are first noticed in canefields. Emergence of cockchafers from the ground usually takes place about twenty-four hours after a fall of from 3 to 4 inches of rain; such swarming serving to indicate that about six to eight weeks later is the best time for carrying out fumigation of grub-infested soil—viz., at a time when these larvæ, being in the first and second stages of growth, are not large enough to cause appreciable injury to the cane roots.

### Capturing Greyback Cockchafers.

Preparations should now be made for collecting cane beetles on plantations where feeding-trees of *albohirtum* happen to be conveniently situated, and can be used as trap-trees.

The broad-leaved figs such as *Ficus pilosa* and *glomerata*, or the "Weeping fig," *F. benjamini*, are great favourites, and generally attract most of the beetles in the vicinity of a cane-field. Where found growing close to headlands it would be a good plan on certain cane areas to cut out surrounding vegetation to within a radius of a couple of chains in order to induce beetles to concentrate upon them, and to facilitate collecting from same. During the first week from 20 to 30 per cent. of greybacks taken in this way will be females, but by the end of the second week after date of emergence the sexes are generally met with in about equal proportions, while during the third and fifth weeks after first appearance of the beetles about 75 per cent. of those collected will probably be females.

### **Remember that Both Sexes of the Greyback Cockchafer are Strongly Attracted by Artificial Lights.**

It is necessary to again remind readers that the so-called "Southern Cane Beetle," *Pseudoholophylla furfuracea* Burm., is a totally different insect from the Greyback of Northern cane-fields. Mr. R. W. Montgomery, Assistant Entomologist, discovered that only about 1 per cent. of females of *furfuracea* are attracted by artificial lights; whereas, it has been conclusively demonstrated during the last fourteen years that both sexes of the greyback cockchafer are strongly attracted to acetylene and other artificial lights throughout their aerial existence. The proportions of female beetles captured in light-traps a few days after emergence from the ground varied from 20 to 25 per cent.; but about three weeks after emergence (early in January) catches during two consecutive evenings yielded 47 to 75 per cent. of the female beetles.

### **Emergence of Cane Beetles.**

Greyback cockchafers commenced to appear on the wing around Gordonvale, Meringa, and Highleigh about the 6th November, when a few odd specimens were seen flying to artificial lights. The earliest emergence noticed by the writer at the Experiment Station was a female greyback which, on 4th November, was attracted from a weeping fig (*Ficus benjamini*) growing against a veranda. No decided flighting, however, took place until 15th November, so that by the time these notes are published this cane-beetle will have started to lay its eggs.

### **When to Fumigate.**

The time to commence treatment of the first- and second-stage grubs of *a-bolitum* (greyback cockchafer) will date from about the third week in December, and continue until the end of January, as long as ground to be fumigated remains free from excessive moisture and the land continues unshaded during midday between the stools of cane.

### **The Farmers' Friends.**

Do not destroy soil-frequenting larvæ which are predaceous or parasitic on cane-grubs.

Some of the commonest of these can be recognised by the following brief descriptions:—

1. White maggot-shaped sluggish larvæ about an inch long, which when ploughed up are often found attached to or alongside dead or paralysed cane-grubs.

2. Dark-brown elongate-oval cocoons from  $\frac{3}{4}$  to  $1\frac{1}{2}$  inches long, composed of silk hardened to the stiffness of writing paper. Those are sometimes exposed by the plough, and contain either male or female digger-wasp parasites.

3. Shining white maggots about  $1\frac{1}{2}$  inches in length, but more slender than those of No. 1, and able to move quickly through the soil by means of a pointed beak. These predaceous larvæ of "Robber Flies" pierce and suck the life juices from various cane-grubs.

4. Large flattened wire-worms, from one to two or more inches long, having yellowish-brown shining bodies with six small legs close to the head-end. These slippery, very active creatures are inveterate enemies of cane-grubs, seizing them with their sharp sickle-shaped jaws, cutting deeply into the body, and greedily imbibing the succulent contents.

### **What Causes "Dead-Hearts."**

Growers should have a look occasionally at the condition of their young plant- and ratoon cane, at a time when the shoots are from 9 to 18 inches high. Wilting or browning of the heart-leaves is usually due to the presence of some caterpillar

tunnelling in the centre of the stem. Although the "Large Moth-borer" is mainly responsible for such trouble, the larvæ of two smaller moth-borers and of a plant-eating beetle are also able to cause similar injury to the central leaves. All shoots affected by "dead-hearts" should be cut out, taking care to sever them at a point situated about 2 inches below ground level. These shoots should then be crushed or burnt to destroy any pupæ or caterpillars remaining in the tunnels. Infestations of less than about 10 per cent. do not as a rule necessitate control measures.

## POSITION IN THE NORTHERN DISTRICTS.

The Entomologist at Meringa (Mr. E. Jarvis) has submitted to the Director, Mr. H. T. Easterby, the following reports on the Innisfail and Ingham districts by Messrs. J. H. Buzacott and W. A. McDougall:—

### INNISFAIL.

This year the Innisfail Show comprised the finest collection of exhibits and events ever yet provided there. In combination with the South Johnstone Experiment Station and the Pathological Branch, a display from Meringa was presented, consisting of various insect pests of sugar-cane and their biological enemies, together with charts and wall cases depicting their life-histories.

The opportunity was taken to talk with the many farmers interested in the exhibit, and to endeavour to advise them, where possible, how to deal with some of the more important pests.

Grubs have been very bad this season throughout the district, though several farmers in the Goondi area fumigated their crop earlier in the season. Mr. MacLean, Field Officer at the Goondi mill, intends carrying out experiments on trapping beetles by light during beetle-flight. He also directed fumigation experiments on a few farms in the early part of the year.

Considering the late month of the year in which the show was held, the competitive cane exhibits were remarkably good, especially taking into account the fact that considerably more than half the cane in the district should be cut by now.

On farms served by the Goondi mill, a favourite green manure is the Rice Bean. This is a good cropper, and comparatively easy to plough in, and, although very subject to the attacks of insect pests, seems to do very well in that district. The Rice Bean is, undoubtedly, of high manurial value.

### INGHAM.

From the 1st to 5th October was spent in the Victoria and Macknade mill areas. The district was dry and very dusty.

#### The Beetle Borer (*Rhabdocnemis obscurus* Boisd.).

Throughout the mill areas the damage by this pest is less than 2 per cent. For the past two years tachinid flies (*Ceromasia sphenophori* Vill.) have not been liberated in these areas. During the five years previous to this, when the borer was a serious pest, 6,127 flies were distributed by officers of the Macknade mill; also several liberations were made by this Station. In the event of borer damage again becoming an economic problem in these areas, the facilities for its scientific control are in readiness at the Macknade mill. The fly cages have not been dismantled, and field officers are in touch with all farms throughout the districts.

#### The Pest Destruction Fund.

The mill areas are divided into ten districts (five in each area). The farmers in each district voluntarily strike levies, payable to a farmer secretary, for the destruction of the various cane pests, chief of which are rats and cane beetles (grubs and adults). This fund is independent of the mill managements, and is in the hands of the farmers themselves. According to the district the levy is struck on area under cane or on tonnage cut.

#### Grub Damage.

The greyback (*Lepidoderma albohirtum* Waterh.) has been responsible for considerably more than 80 per cent. of the grub damage in these areas. The last attack was very mild, only showing up on a few farms in the Hawkins Creek, Cordelia, and Stone River districts. The affected fields were cut early. In the

Macknade district, £177 1s. was paid in 1924-5 for grubs and beetles collected; in 1925-6 £127 9s. 7d.; and in 1928 £1 4s. 6d. In both mill areas, at present, the grub damage is negligible.

### Damage by Rats.

It is to combat the rat trouble that most of the money of the various pest destruction funds is spent. The Macknade district pest destruction fund paid in 1926 £4 for poison; in 1928 £30 4s. 6d. for poison, and for labour for dropping baits £108 (approximately). At 6d. a rat, from 2nd July, 1928, £72 has been paid to collectors. The remaining districts are in a similar position with regard to rat damage, and, with the exception of one district which pays 3d. a rat, offer 6d. a rat to collectors.

Various poisons have been tried—viz., phosphorus and bread, strychnine and corn, arsenic baits, and the barium biscuit. At present the subject of rat poisons is in its experimental stage. The barium biscuit, for many reasons, would be the most suitable, but some farmers doubt its worth as an effective rat destroyer. It is thought that for rats the poison should be changed periodically.

### Green Manures.

Last year 900 acres of green manure (chiefly Mauritius bean) were grown in Victoria mill area. In Macknade mill area 500 to 600 acres were planted last year, and approximately 1,000 acres (chiefly the two cowpeas and Mauritius bean) this year.

### The Burning and Turning in of Trash.

If the field is to be ratooned the trash is burnt, but, before planting, more than 50 per cent. of farmers turn in the trash. As there is no borer problem to contend with, the mill authorities strongly recommend turning in of trash before planting. This practice is becoming more prevalent every year. By various analyses it has been proved that the turned-in trash is equal to one-to-two lots of green manure.

### Cane Varieties Grown, and Gumming.

The following table gives the relative percentages of the different varieties planted in 1926 and 1927:—

Var. ety.	Macknade Mill Area.		Victoria Mill Area.	
	1926.	1927.	1926.	1927.
	Per cent.	Per cent.	Per cent.	Per cent.
Badila .. .. .	22.0	24.2	32.4	31.8
H. 409 .. .. .	35.9	24.0	20.3	22.0
N.G. 24, N.G. 24A, N.G. 24B	5.6	3.9	9.6	7.1
Korpi .. .. .	15.1	17.1	9.9	11.2
Nanemo .. .. .	3.5	3.9	3.1	2.3
Orambo .. .. .	5.3	12.1	8.1	8.6
Q. 813 .. .. .	9.8	13.7	15.2	14.6
Innis .. .. .	0.8	0.8	1.1	1.2
M. 1900 Seedling .. .. .	..	..	..	0.1
H.Q. 426 .. .. .	..	..	..	0.2
7 R. 428 (Pompey) .. .. .	0.3	..	0.1	..
Mixed (including D. 1135) ..	1.7	0.3	0.2	0.9

Before planting any varieties other than the first ten in above table, permits must be obtained from the mills. Mill officers see that clean plants are used for all planting throughout both mill areas. In 1926, 35.9 per cent. of the plant was H. 409. This dropped to 24.0 in 1927. At that time it was thought that this variety was too susceptible to gumming. Now, however, H. 409 is more extensively planted, as it was found that it is not so susceptible as it was first supposed to be.

H.Q. 426 is condemned on account of its extreme susceptibility to gumming, and the 0.2 per cent. planted in the Victoria area is for experimental purposes. It is under strict supervision.

Thanks are due to the chief field officer at the Macknade mill and the secretary of the Herbert River Farmers' League for information supplied.

## BIOLOGICAL CONTROL OF CANE INSECTS.

Mr. E. Jarvis, Entomologist at Meringa, has submitted the following report for the period of September to October, 1928, to the Director of the Bureau of Sugar Experiment Stations (Mr. H. T. Easterby):—

### Vegetable Parasite of Cane Borer.

About four months ago some test tubes containing cultures of a vegetable parasite known to attack a beetle borer (*Rhabdocnemis* sp.) found to affect sugarcane in the Philippines were brought to this Experiment Station, instructions having been previously received from the director regarding the advisability of our studying its possibilities as a controlling factor against *Rhabdocnemis obscurus* Boisd. under North Queensland climatic conditions.

These cultures, which were prepared by Mr. A. F. Bell, Pathologist to the Sugar Bureau, in September, 1927, were grown on corn meal agar. During June of 1928 this fungus was successfully propagated on sterile slices of potato, and by the fifth day Mr. J. H. Buzacott, Assistant to Entomologist, who had been given charge of this work, noticed a growth of hyphæ, on which fructification appeared on the ninth day after inoculation; the average shade temperature during this period being about 66 degrees Fahr. Of the various methods of infection tried, that of spreading the spores on a piece of cane sectioned longitudinally and placing same with caged beetles was the only one that gave positive results. Other methods used were—

- (2) Inoculating the beetles by a platinum wire;
- (3) Placing them in a culture tube to crawl amongst the spores; and
- (4) Sprinkling the beetles with water containing spores of the fungus.

Additional experiments carried out in September, 1928, demonstrated that this vegetable parasite will grow luxuriantly on sterilised rice; spores of the fungus being produced on this simple medium on the fifth day after inoculation.

### Breeding and Distributing Parasites of the Weevil Borer.

The increase of *Rhabdocnemis obscurus* Boisd. having been favoured, as was expected, by conditions brought about by the last cyclone, special attention has been bestowed on the breeding of *Ceromasia sphenophori*, with the result that during the last few months (April to August, 1928) 1,127 living specimens of this tachinid fly were reared at Meringa Experiment Station and released on thirty-one different selections among borer-infested cane. In addition to these consignments, field boxes were established at Mourilyan and Mount Sophia, holding cane sticks containing in all about 150 puparia of *C. sphenophori*.

Liberations of live tachinids were made on mill areas of the following districts:—South Johnstone, 463 specimens; Goondi, 295; Babinda, 232; Mulgrave, 107; Mourilyan, 30.

The work of breeding and liberating consignments of this useful parasite has been given to Mr. W. A. McDougall, Assistant to Entomologist, who has shown much interest in this branch of biological control.

### Entomological Exhibit at Innisfail.

Our Experiment Station was represented this year at the meeting of the Johnstone River Agricultural Society, held at Innisfail on the 5th and 6th October.

Despite industrial trouble on the waterfront, which prevented many growers from attending, the show at Innisfail this year was considered to be the best ever held in the district. The Station exhibit, under the charge of Mr. J. H. Buzacott, comprised showcases containing examples of North Queensland cane insects, amongst which were included the various life-cycle stages and insect enemies of primary cane pests such as *Lepidoderma albobirtum* Waterh. (greyback cockchafer); and the weevil borer of cane, *Rhabdocnemis obscurus* Boisd.

Other attractions were large diagrammatic coloured charts illustrating insect life, and a number of store-boxes holding pinned specimens of many insects of decided economic importance.

Several growers availed themselves of the invitation to freely discuss matters relating to the control, &c., of insects which chanced to be troubling them, or to seek information regarding cane beetles and their grubs.

**Review of Past Field Tests with the Grub Fumigant—Paradichlorobenzene.**

Between the dates 17th January, 1923, and 11th February, 1924, sixty-one experiment plots, of size varying from  $\frac{1}{16}$  to  $\frac{1}{4}$  acre, were laid down in various cane fields in the district of Cairns. Fumigation of the treated plots was made with a hand injector designed by the writer for this purpose; while the doses of paradichlorobenzene used varied from  $\frac{1}{16}$  to  $\frac{1}{4}$  oz. (apoth.), and in most cases were buried  $4\frac{1}{2}$  inches deep, 12 to 18 inches apart, and 4 to 6 inches from the cane stools. Thus, the quantities used per acre varied from about 60 to 200 lb., which, however, comprised several brands, differing in price and quality.

Most of these plots were fumigated during the month of December, several in January and February, and a few in November.

The cane varieties treated were mostly D. 1135 and Badila, which had been planted during July, August, and January.

Sixteen field plots fumigated with paradichlorobenzene, but which were not grub infested, served to illustrate the fact that this chemical has no injurious effect whatsoever on the ultimate growth and development of the cane, seeing that the stools on all of these test plots were found at the end of the growing season to be equally as fine and healthy as those on a similar number of check plots alongside each of the fumigated areas.

On the other hand its effectiveness against cane grubs, when these were present, was amply demonstrated on plots at Woree, Meringa, and Highleigh (see Bulletin No. 19, pp. 39 to 47, Division of Entomology).

**Success of Paradichlorobenzene in Russia against Scarabæid Grubs in Vineyards.**

It will be of interest to mention that this fumigant has recently proved successful in Russia for destroying grubs of *Polyphylla fullo* L. a cockchafer which is very closely related to our own greyback cane beetle. The following extract from an article published in 1927 (Kiev. Nat. Commiss. Agriculture) gives a brief account of the method of applying this fumigant in Russia:—

“Paradichlorobenzene has proved effective for the control of *Polyphylla fullo* L. in the vineyards of the Lower Dnieper. Other larvæ occurring in the soil are also killed. It should be used at the time of planting out the young vines, which should be set at a distance of 21 inches, in rows 7 feet apart, and the fumigant should be placed in holes 21 inches apart, the lines of holes being also 24 inches apart. The paradichlorobenzene is applied at the rate of about  $\frac{1}{4}$  oz. to each hole at a depth of about  $3\frac{1}{2}$  to 4 inches and covered with soil. This applies to sandy soils; in heavier clay soils the dosage should be increased to about  $\frac{1}{2}$  oz.

“Both larvæ and pupæ are killed by this treatment; oviposition seldom occurs in treated soil, and if eggs are laid the larvæ are killed soon after hatching. The effect of the fumigation lasts throughout the summer and does not injure the young plants.”

*Note.*—The above recommendations as to weights of doses, distances apart, and depths of injections are practically the same as those which have long been recommended by our own Sugar Bureau for combating the grubs of a very similar species of cockchafer—viz., the notorious greyback beetle of our Northern canefields.

It is certainly very interesting to learn that the successful results now secured against *Polyphylla fullo* L. in Russia are practically the same as were obtained by us with paradichlorobenzene during the years 1923-24, which the reader will find reviewed under another heading in the present monthly report.

For the control of root-eating grubs in canefields, see full details given in the “Queensland Agricultural Journal,” vol. xxix., pp. 97-113.

**If you like the “Journal,” kindly bring it under the notice of your neighbours who are not already subscribers. To farmers it is free and the annual charge of one shilling is merely to cover postage for the twelve months.**

## FIELD EXPERIMENTS AGAINST GRUB INFESTATION.

The Assistant Entomologist at Mackay (Mr. A. N. Burns) has submitted the following report for the month ended 12th November, 1928, to the Director of the Bureau of Sugar Experiment Stations (Mr. H. T. Easterby):—

### Field Experiments against Grubs at West Plane Creek.

Continuing a series of experiments commenced by Mr. R. W. Mungomery in February last, in accordance with a request made by the Plane Creek Central Mill Company and some of the West Plane Creek growers, a grub survey was carried out in order to establish a suitable location for laying down several fumigation plots.

In the summer of 1927 practically all the farmers at West Plane Creek suffered severe loss of cane through grubs of the greyback cane beetle (*Lepidoderma a bo-hirtum* Waterh.), and, in consequence, when the beetle emergence of the 1928 summer took place, hand collecting of beetles was largely resorted to, and the feeding trees in the immediate vicinities of canefields were in many cases destroyed. These factors, combined with the abnormally wet season, were most probably responsible for the marked decrease in grub infestation in this area this season. It was, therefore, fairly difficult to locate a site where conditions were most favourable for experimentation, the principal drawback for fumigation tests being that grubs were not present in large numbers. A spot was decided upon, however, and four plots (with controls) were put in. Results of these are summarised hereunder.

### Paradichlorobenzene (Crude Quality).

This plot comprised seven rows each 1 chain long, fumigated with  $\frac{1}{2}$ -oz. doses on either side of the cane stools. Doses were placed about 3 inches deep and from 3 to 4 inches away from the stools. A control block containing six rows of cane on the southern side of the treated plot was marked out. The final inspection of this plot (11th October, 1928) showed that the fumigated cane was erect and green and in every way superior to that in the control area, and more particularly when compared with the adjoining cane on the northern boundary, which presented a very withered appearance. This, as well as all the other plots, received  $5\frac{1}{2}$  inches of rain a few hours after injecting, so this may have had a slight influence on the results obtained.

### See-Kay.

As the Plane Creek Central Mill Company had a sample of this material on hand, a request was made to fumigate a few stools with it whilst the other plots were being injected. Accordingly two rows, each 1 chain long, and adjoining the paradichlor. control plot boundary, one on either side, were injected with  $\frac{1}{2}$ -oz. doses placed on either side of the cane stools, 3 inches deep, and about 3 inches from the cane plants. Considerable difficulties were experienced in injecting this plot, as the see-kay was very moist and sticky, and contained large masses of a gelatinous substance, which prevented free injection. A quantity of the freer material was separated and used, but this, however, still being sticky, gave much trouble in injecting. A final inspection (11th October, 1928) of this plot showed that the two treated rows of cane were considerably greener and better than the cane in the adjoining control blocks. The contrast, however, was not as marked as that obtained with the plot fumigated with paradichlor.

### Carbon Bisulphide.

Five rows, each one chain long, and adjacent to one of the "See-Kay" rows on the southern side, were injected with  $\frac{1}{2}$ -oz. doses of this fumigant. The doses were applied on either side of the cane stools, to a depth of 3 inches, and from  $2\frac{1}{2}$  to 3 inches away from the cane plants. At the final inspection of this plot (11th October, 1928) the results were somewhat disappointing. Very little difference was discernible between the fumigated cane and the cane in the adjoining control block. The cane was poor in both plots. In the case of this, and the following experiment, no doubt the precipitation of  $5\frac{1}{2}$  inches of rain a few hours after injecting would materially affect these plots; results should, however, have been better, as both plots were reinjected in fine weather some two weeks later.

### Carbon Bisulphide and Paradichlorobenzene (Saturated Solution).

A request was made to treat a small area with a mixture of the above two fumigants, as good results had been reported at different times from their use in cane fields. A plot of five rows, each one chain long, was therefore fumigated with  $\frac{1}{2}$ -oz. doses placed each side of the cane plants; 3 inches deep and from  $2\frac{1}{2}$  to

3 inches away from the cane plants. As stated above, owing to the very heavy rain that fell almost immediately following fumigation, this plot was reinjected some days later. The final examination of this plot (11th October, 1928) did not reveal as good a result as had been anticipated, the difference between the treated cane and the control area alongside being only slight. The adjoining cane on the southern boundary was decidedly more withered, but the comparison with the actual control block (which was on the northern side) was not so marked.

### Emergence of Frenchi Beetles (*Lepidiota frenchi* Blkb.)

Following a fall of some 1½ inches of rain spread over a period of three days (5th, 6th, and 7th instant) a small emergence of these beetles occurred at the Experiment Station and grass lands adjoining. The beetles commenced to leave the soil at dusk (about 6.50 p.m.) and continued to fly about for some twenty minutes or so, by which time most of them had mated and become quiescent. By 8 p.m. only isolated specimens were to be noted resting on cane plants, low bushes, &c. A large number of the beetles was collected, and it was interesting to note that these were all considerably undersized, and were paler in colour than is usual. They had evidently emerged from their cells before they had properly "hardened up" as their elytra and bodies were quite soft, and the white dusted scales on their bodies usually so noticeable in this species were only faintly visible. This may be confirmed by the results of observations made from specimens being bred in cages at the Laboratory, where the actual emergences from pupæ were about that time taking place. The examples, too, that emerged in this flight could only be those that had pupated close to the surface, as the rain had penetrated to a depth of only about 8 inches. The beetles being undersized is probably accountable from the fact that from last June up to the present fall of rain, the precipitation for these five months has been only 1.17 inches. Flying at the same time as the "frenchi" beetles were odd specimens of the Dasygnathus Beetle (*Dasygnathus australis-dejeani* Boisd.), the Isodon Beetle (*Isodon puncticollis* Macleay), and a small species of Melolonthid, probably *Haplonycha* sp.

### Occurrence of the Common Cane Skipper (*Teliceta augias-kreffti* Macleay).

During the past few weeks the larvæ of this butterfly have been unusually plentiful in canefields on the leaves of young plant and ratoon cane. The writer has not before observed them in such numbers, and so widely distributed; in one instance no less than six larvæ were taken from one cane plant.

The eggs are deposited singly on the upper surface of cane leaves and shoots; they are of a yellowish pink (sometimes entirely yellowish) colour, slightly flattened at the top, and, if viewed through a lens, will be seen to be ribbed longitudinally. The period of incubation occupies from six to eight days. The young larva on emergence from the egg is creamy green with the head black. After the first moult, the head becomes brown, and the body pale green. The fully grown caterpillar measures approximately 1½ inches in length. Individual examples vary very considerably in the coloration of the head; it is usually pale yellowish brown or light brown without any markings. Some specimens, however, have black markings forming a triangle on the front of the face, and extending from the vertex to the mouth, sometimes enclosing a small brown spot just above the mouth. The apex of the triangle is situated at the vertex. One example was taken recently along with many others, which had the head entirely black. The body is always translucent apple green, sometimes slightly suffused yellowish. Occasionally specimens are met with having a small black spot on the anal plate, dorsally. Larvæ shelter within portion of a rolled leaf drawn together with threads.

The pupa is also enclosed in a rolled leaf; it usually measures about ¾-inch long, though many are less than that. It is pale brown in colour, with a raised black spot on either side of the dorsal area, just behind the head. The head bears a slightly raised rounded cap or operculum; cremaster slightly darker brown, prominent. Sometimes examples are seen in which the abdominal segments are suffused greenish, the green colour showing through the pupal skin from the internal tissues. This stage occupies slightly less than two weeks.

The adult butterfly measures about 1½ inches across the expanded wings, and is coloured as follows:—

Male (above).—Forewing brown-black, cell and base to sub-apical area, including three sub-apical spots; orange; distal area, composed of confluent spots; orange; cilia, brown black becoming orange towards lower angle. Sexmark prominent, dull black, edged black.

Hindwing brown-black, a large cellular spot and a broad irregular distal band, orange. Cilia, orange.

Beneath.—Forewing brown-black, apex and outer edge suffused orange brown, a large cellular spot and three spots near outer edge, orange yellow. Spots on upper side of wing faintly visible.

Hindwing orange brown, cellular spot and markings near outer edge as above, but paler and suffused brownish.

Female (above).—Forewing dark brown, a large cellular spot extending to beyond middle of wing, orange, three sub-apical spots, orange, a band of irregular orange spots near the outer edge. Cilia, brown-black, yellow near hind margin.

Hindwing dark brown, a small cellular spot, and distal band of confluent spots, orange. Cilia, orange.

Beneath.—Forewing as in male, markings near outer edge narrower.

Hindwing as in male, markings near outer edges narrower.

This butterfly feeds naturally on blady grass (*Imperata arundinacea*) and has a very wide range, extending from Illawarra to Cape York. The true *Telicota augias* (Linn.) occurs in Java.

## FIELD REPORTS.

Mr. J. C. Murray, Southern Field Officer, has submitted the following report for the period 12th September to 12th October to the Director of the Bureau of Sugar Experiment Stations, Mr. H. T. Easterby:—

### GIVELDA.

The cane here looks well, but rain is needed to bring up the newly planted areas. Cane varieties growing are M. 1900 Seedling, Q. 813, H.Q. 285, Black Innis, and D. 1135. High c.e.s. values are being obtained for all of these.

In ratooning Q. 813 farmers are recommended not to use implements too vigorously and to be careful not to touch the stool. The root system of this variety is small and the stool is easily dislodged.

A considerable amount of fertilising has been done in this locality, the results indicating the value of potash. However, the growers have no really definite information as to which manure works the best, because so far they have carried out no local experiment. In regard to making a manurial experiment on his farm a grower would possibly reason as follows:—"I am not getting the tonnage I should get, yet the ground is well worked, the rain has fallen fairly regularly, and there is no serious disease. My soil must be getting short of plant food. When I come to think matters over, I have been on this farm for fifteen years and have put nothing back into it. It is obvious this is not a good state of affairs."

The farmers must then think of two things—what to apply and the method of application. The latter question requires careful consideration, as the practice of manuring has shown. There are three accepted methods—placing manure in the drills; drilling about a foot away from the cane when the plants or shoots are about six weeks old; and broadcasting on the interspaces. The latter method has a good deal to recommend it, as an even distribution of fertiliser is obtained over the field. Once a cane crop is well established the roots are taking tribute from every inch of soil. Experiments with manures should be combined with methods of application. Fertilisers that are a source of nitrogen (sulphate of ammonia and nitrate of soda) should not be applied unless conditions are moist. Farmers are recommended to green manure on the Givelda soils.

### MULLET CREEK.

The cane in this locality appears to be good, although in some instances the c.e.s. values are not absolutely satisfactory. This applies more particularly to the E.K. 2 and D. 1135. Other varieties growing are B. 208, M. 1900 Seedling, H.Q. 285, and Q. 813; Q. 855 was also noticed coming to the siding. There is a considerable improvement noticeable in regard to transport facilities in the Mullet Creek area, the majority of the farmers now hauling with motor lorries.

The following recommendations are made to growers in the Mullet Creek district. Whatever cane the farmer decides to grow he should be very careful to get healthy plants. On the state of the set and the quality of the early cultivation depends very largely the success of the ratoon crop. Make the plant crop vigorous, and with few exceptions, good ratoons will be obtained.

Manuring, but only after local experiment, should be practised. Chance application of commercial fertilisers is not at all in the best interests of the growers of sugar-cane.

### WALLAVILLE.

The cane on the line between Goondoom and Wallaville looks very healthy, but rain is wanted. Very fine cane of high sugar content can be grown on these dark soils. The railway is convenient for the farmers, the department having an excellent service with a siding every mile or so.

Cane varieties making a good showing here are M.1900, Meerah, Q.813, H.Q.285. Unfortunately, Meerah is a variety susceptible to gumming disease, therefore the growers are advised to be cautious about planting it.

### BAROLIN.

The soil in this area has retained its moisture splendidly in the face of a spell of very dry weather. Rarely can dry soil be found at a depth of eight inches. The cane is striking well and is healthy. If rain comes reasonably soon there should be a good summer showing of cane. The farmers are doing a certain amount of fertilisation, mainly bonemeal and potash.

Cane-growers often inquire as to the difference between steamed bone and raw bone. The following particulars will be of value to them:—

Raw bone contains about 4 per cent. of nitrogen and 22 per cent. phosphoric acid, about 5 to 7 per cent. of which is soluble, the rest being insoluble. The phosphoric acid in raw bone is slowly available to plants, its usefulness extending over several years.

Steamed bone has been so treated to free it from fat. Fat is more or less objectionable in a fertiliser. Steaming reduces the nitrogen in the bone so that it contains about 28 to 30 per cent. of phosphoric acid and about 1½ per cent. of nitrogen. About 6 to 9 per cent. of the phosphoric acid is available. Steamed bone can be ground much finer than raw bone and this greatly increases its value for immediate use.

Generally, the prospects are good. The standard of farming is high, although all interspace work is taking longer than it should—that is, if it is done thoroughly. Full width distributions for interspace manuring are also required. These should be simple and cheap. A hopper box supported by two sulky wheels with rakes behind will answer the purpose.

The small grower should be careful not to impose an undue burden on himself with machinery. Over capitalisation should be carefully avoided.

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*Mr. J. C. Murray, Southern Field Assistant, reports, 19th November, 1928:—*

The spring has been dry, consequently the cane planted after the winter has been very slow in coming up. Notwithstanding this, the percentage of misses will not be high. All the mills have had to reduce their original estimates, but this has been compensated for by the high c.e.s. value of the cane. It is very much better to grow small crops of high sugar value than big crops low in c.e.s.

### THE ISIS.

**Autumn Plant.**—Growing well, but affected by dry weather. Apparently free from serious percentage of disease infection.

**Spring Plant.**—Striking slowly and rain wanted. This has been a puzzling spring for the growers, the early part being much too cold to plant, and as the soil warmed the weather became increasingly dry. It is probable that the spring plant cane will be satisfactory.

**Ratoons.**—Ratoons this spring are very good. In most fields the shoots grow without any evidence of shyness. The most vigorous observed were the Black Innis

ratoons. This cane is coming into favour in this district. It is a variety that stools and ratoons with quick-growing qualities and a good sugar content.

Standover.—There was not much standover cane in the Isis area. It cut in good condition with a high average c.c.s.

Cane varieties looking well in the Isis district are:—N.G. 147 and N.G. 103 on Mr. Garnstrom's farm at South Isis, E.K. 28, M. 1900 Seedling, Black Innis, Q. 813, and H.Q. 285. As standover canes N.G. 16 and Badila are making a good showing. It is worth noting by cane-growers that Black Innis is thought to be identical with M. 189 (see "Varieties of Sugar Cane in Queensland," 1926, Bulletin No. 2 of the Bureau of Sugar Experiment Stations).

The two first named are making a good showing. N.G. 147 was introduced by the Bureau of Sugar Experiment Stations from New Guinea in 1912, as also was N.G. 103. Both these canes were again brought in from New Guinea in 1914 by the C.S.R. Company. Following are descriptions:—

N.G. 147.—Habit—erect; internode—barrel shaped; waxband—heavy; eye-groove—long and shallow; leaf-scar—prominent; eye—strong, medium-sized, well defined; trashes—freely; root system—light; colour—dark brown.

N.G. 103.—Colour—olive green, with light red to brown-coloured stripe; habit—erect; waxed—heavily; internodes—barrel shaped; eyes—medium and pointed; stooler and germinator—good.

Another variety that is making very good growth is E.K. 28. When thinking of cane varieties, farmers should remember that no man can speak with any authority unless he has had a cane under observation for at least six years. There is an inclination in recent years to make definite pronouncements prematurely regarding sugar-cane varieties—pronouncements perhaps on one season's observation. This is very foolish and misleading, as is amply shown when varietal resistance to disease is spoken of.

### BOOYAL AND DALLARNIL.

Farmers in these areas are well satisfied with their crops from a c.c.s. point of view. The cane was light owing to the dry weather. No hitch has occurred throughout the crushing season. Regarding varieties and general agricultural conditions, there is nothing fresh to report since last visiting these places.

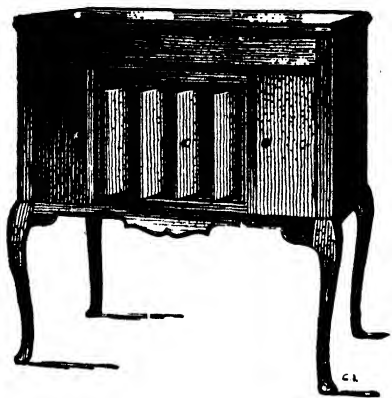
### MARYBOROUGH.

Crushing here proceeded smoothly throughout the season, and farmers appear to have had satisfactory returns. The cane is ratooning very well. The plant cane is also satisfactory. The industry here is on a small scale, but is nevertheless in a promising position. Interest is now taken in better varieties, the wiping out of disease, and the use of fertilisers. There are still some cane varieties that should not be grown in the Maryborough district. When planting again, growers are requested not to grow Meerah, Rappoe, or Striped Singapore.

Some of the land requires draining. The best kind of drain on the river flats would be what is called a ditch drain. This should be about 2 feet deep and about 8 feet wide. All kinds of farm implements can pass over a drain of this description. It is the most serviceable wherever it will drain the land sufficiently. The grade of an open ditch must necessarily be low, otherwise the soil will wash. A fall of about 6 inches is enough. Curves should be very gradual, especially if the fall is greater than this. If a ditch of this description were running full after heavy rain, the water would be flowing at about 7 miles per hour. It is best, therefore, to build these ditch drains with a very gradual fall. Plant grass in them, if possible. It would appear that a drain of this type takes up a lot of land, but it should be remembered that badly drained land is the cause of heavy loss to Queensland farmers.

### PIALBA.

At the time of visiting this district wagons and lorries were beginning to come in with a flag of green tops, indicating the last load. The season's operations have been smooth, no hitch occurring during the crushing. The weather has been very dry, nevertheless the ratoons are making an excellent showing. There should be a very good ratoon crop here next year. Regarding cane varieties, there is nothing fresh to comment upon since last visit. Probably the highest c.c.s. values were obtained from Q. 813.



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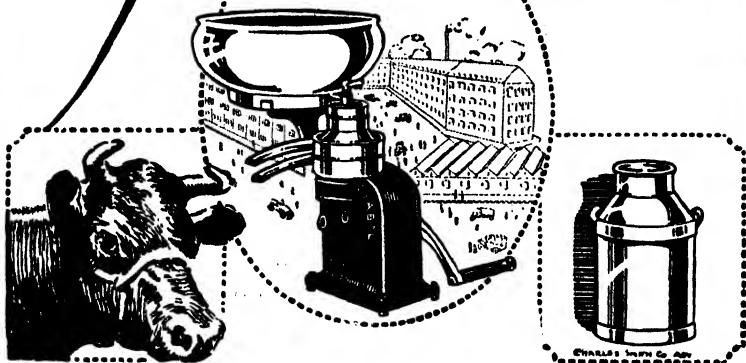
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*The Northern Field Officer, Mr. A. P. Gibson, has submitted the following report on the important sugar-producing area of Innisfail, for the period 17th September to 19th October, to the Director of the Bureau of Sugar Experiment Stations, Mr. H. T. Easterby:—*

### Weather.

The weather for this period has been warm, dry, and dusty. Tanks are empty, wells are failing, water for domestic use is scarce, and is being carted, costing 8s. per 100 gallons, and there is much sickness. A good general rainfall is urgently required.

### 1928 RAINFALL.

		Innisfail, South Johnstone Sugar Experiment Station.	
January	.. ..	15.45	11.12
February	.. ..	26.25	26.82
March	.. ..	34.50	30.72
April	.. ..	5.90	7.90
May	.. ..	9.07	8.68
June	.. ..	1.73	1.26
July	.. ..	5.15	5.11
August	.. ..	3.78	3.66
September	.. ..	0.02	0.12
October (to 22nd)	.. ..	0.08	0.00 (to 13th Oct.)
		101.93	95.39

### The Crop.

The district crop is composed mainly of Badila; this kind possesses the qualities of a good all-round cane on the better Northern lands. At the moment the crop is expected to yield about 42,000 tons more cane than that milled in the season 1927. Obviously, this tonnage would have been much greater had not cane grubs, weevil borers, and premature arrowing seriously affected its growth. The dry harvesting time has, however, permitted its quick removal, and at the same time proved favourable for its ripening. Sometimes crops experiencing abnormal growth, owing to drought or early tasseling, ripen speedily. When the ripening period is short, the cane becomes over-ripe and loses its sugar. Should nothing unforeseen happen, little, if any, of the 1928 crop will be left by the middle of December.

### MILL ESTIMATES.

		Cane Milled, 1927.	Cane Estimated, 1928.	Approximate Tonnage of Cane Crushed.
		Tons.	Tons.	
South Johnstone	.. ..	156,340	178,000	(to 13th Oct.) 128,000
Mourilyan	.. ..	164,882	160,000	(to 13th Oct.) 100,000
Goondi	.. ..	151,430	177,000	(to 29th Sept.) 119,000
		472,652	515,000	347,000

### Cultivation.

The use of tractors, big and small, is ever increasing. They are foremost in hastening operations, and in cheapening most of the field work. They have taken the place of horses in hauling the loaded cane trucks from fields to permanent ways. Sometimes the field line is damaged, the result of a careless, inexperienced driver. Rotary hoes or cultivators are increasing in popularity; they may be attached to most modern wheel or caterpillar types of tractor. The chief uses are as follows:—

- Finely dividing exhausted cane stubbles, before ploughing;
- Tilling early the soil between the cane rows;
- Chopping trash to pieces, before it is ploughed in;
- Early weed destruction on headlands or resting fields;
- Shaving the surface of improperly harvested or high stools. This operation requires common sense, otherwise damage instead of good will result—the hoes should be kept reasonably sharp. Several farmers still toil with the old bow and arrow type of cultivation.

### **Pests and Diseases.**

These are responsible for much deterioration or total crop destruction. The essential preliminary to the abolition of these is to outlaw them. They continue to spread, mainly, by indifference or ignorance. Cane grubs and the weevil borers in parts still are formidable pests. Rats, army caterpillars, and the larvæ of the big top moth and tineid moth borer also were noted. Leaf Scald is widespread and very severe in H.Q. 426 and Goru family of canes at Silkwood and El Arish.

### **Fertilising.**

The quantity used is annually increasing. Different quantities, different manures, and different methods of distribution were noted. The time of application so that the crop derives the best results is ever a problem. Lack of moisture for the present may hinder the finer cane roots assimilating the fertilisers which are being added.

### **Green Manuring.**

This is not grown to the extent that it deserves to be; the soil in this region—especially the porous red—seems to be lacking in organic matter. The growing of leguminous crops and the ploughing in of trash, where practicable, are highly desirable for its improvement.

### **MOURILYAN.**

The management of this mill keep on trying to improve factory conditions.

### **Milling.**

The variety almost entirely grown is Badila. The harvesting of some Pompey (7 R. 428) has been purposely delayed and an increased sugar content resulted. The factory is milling clean cane of high quality. Its crushing rate per hour and the mill efficiency are greater than ever before; 51.8 tons of cane are being crushed per hour, 7,002 tons of cane being the greatest amount treated in a 44-hour week. The mill average c.c.s. for the week ended 13th October was 15.92 per cent.; for the season to date, 14.14 per cent.; 7.23 tons of cane were wanted to make one ton of sugar. Only 0.8 per cent. of the crop has been fired before harvesting; this is most satisfactory. Work in the field is being hurried along; the weather being dry for so long there should be no excuse for grassy or poorly tilled crops. Pests, though severe in isolated parts, are fewer here than in neighbouring mill areas. Despite the long and prevailing dry weather the new crop looks wonderfully green; the curling of the leaf suggests that it is in serious need of moisture. Recently planted cane will suffer more than that planted and established; the dry hot soil will rob the plant of its moisture, when it will become weak, or completely perish.

### **SOUTH JOHNSTONE.**

Much of the 1927 crop was late cut and was short of stem when it tasselled. This, and severe grub and weevil borer destruction, reduced the first estimate by fully 20,000 tons. There is much undulating, volcanic, red, rather porous soil in this area, and the planting of cover crops would improve its fertility and retard plant food leaching; this at the moment is just a patchwork of striking colours. The crop growing on high and low land is now showing signs of distress.

The main kinds of cane grown are Badila, H.Q. 426, and some Goru. The two last mentioned are much diseased in parts, and in some instances are grown on Badila land. The Goru family of canes should be entirely ruled out, and more attention should be paid to the selection of healthy and pest-free seed. If the farmers could be induced to pay more attention to this and refrain from using different varieties for filling the vacant spots in plant cane, the area of disease would be considerably lessened. Some cane ratooned poorly. The perishing canes are good breeding places for the borer, and, also, are likely to cause dry rot in the stool.

The mill has been working for some time now; it was not working full time when the area was inspected, owing, it was said, to some gangs refusing to harvest certain cane crops until fired. The greatest amount of cane treated in a 48-hour week was 7,329 tons, and in a 44-hour week, 6,890 tons.

### **EL ARISH.**

Here the growers are returned soldiers; they produce about 30,000 tons of cane annually. The bulk of the harvested cane is sent to nearby railroad stations, whence it is derricked from small to big wagons and railed to the Tully for milling. The prevailing rainless weather has enabled the harvesting and cultural operations to proceed without interruption. Badila is mainly grown. H.Q. 426 and a lesser quantity

of other kinds were noted. Some cane stubbles have produced too long. Lack of money to clear the field of its encumbrances so as to permit the use of the plough has been the major reason for this. More land is being brought under the plough annually. In some instances the cost of production and work of the back-breaking type could be minimised by drawing the scattered field logs together, or, better still, right off the area, thus permitting the judicious and timely use of light interspace implements. Obviously much depends on proper plant selection. Farmers should exercise the greatest of care when selecting their seed. There is overmuch Leaf Scald in the area. H.Q. 426 is seriously troubled with this, and Badila is to a lesser degree. Two stools of Brown Rot were located; bananas, like cane, are also affected with this complaint when grown adjacent to certain kinds of stumps in new scrub land. Weevil borer damage was bad in parts. Larvæ of the big top moth borer and the tineid were noted. Rat injury was more severe along creeks.

*Lime*.—A small quantity of burnt coral has been used, and the result will be watched with interest.

### GOONDI.

The bulk of the available cane to harvest has been cut. Operations in field and mill have proceeded smoothly and well since the beginning. Varieties grown are Badila in the good land and Pompey in the poor. The latter mentioned kind is being reduced as much as possible. Farmers here seem to realise more the great benefits to be gained by green manuring; many resting fields have been planted with Mauritius beans; this, like cane, requires rain. Greater efforts to improve the soil by trash conservation are conducted here; such a procedure is always considered good farming. In some quarters it is regarded as a medium through which some pests and fungi are carried over to subsequent crops, and therefore is better fired. Cane trash is treated in one of the many following ways:—

- (a) Fired;
- (b) Volunteered;
- (c) Relieved; trash drawn off cane stools only;
- (d) Rolling; trash removed to alternate drill and the bared interspaces tilled;
- (e) Ploughing in of trash; best of all, but not practicable at all times.

When trash is left on the surface it decomposes or is weathered, so that the most valuable part of it is lost to the atmosphere.

Grub destruction was severe. This pest seriously undercuts the stubble foundation or rooting system, and the cane rapidly perishes. Early in October, farmers reported having seen some mealy back beetles on the wing.

### BABINDA.

*Mr. Gibson reports on the Babinda sugar-cane producing areas, inspected 23rd October to 3rd November, as follows:—*

#### Weather and Rainfall.

Hot, sunny, rainless days, with moderately cool nights, were experienced during the month.

January	..	..	13.20
February	..	..	26.24
March	..	..	44.28
April	..	..	6.21
May	..	..	11.06
June	..	..	1.66
July	..	..	5.96
August	..	..	3.84
September	..	..	0.10
October	..	..	0.10
November	..	..	0.34 (to 3rd)

112.99 inches (to 3rd November).

It will be noted that very little rain has fallen during the last eight weeks, which is unusual for the locality, which is recognised as being the wettest in Queensland. This abnormal stretch of hot, dry weather parched the vegetation and diminished

the water in the creeks, but, providing it does not last too long, will be a blessing in disguise in so far as cane culture is concerned, for the following reasons:—

- (a) It has maintained the crop sweetness and permitted it to be harvested in a quicker time;
- (b) It has ameliorated the soil and improved its mechanical condition;
- (c) It has enabled farmers to thoroughly till and suppress the weed growth. Furthermore, when rain does fall, the new crop being clean, well tilled, and still growing, must quickly cover the bare interspaces, thus reducing weeding and production costs.

Rising day and night temperatures, accompanied with different sky appearances at the end of October, heralded a weather change. Some rain of a patchy nature fell on the 1st instant; this, though small, will do good and has gladdened the hearts of the farmers.

Badinda is one of the most desirable cane-producing areas of the North, in that it has the soil, the rainfall, the climate, and the field problems are less numerous than those situated where the rainfall is insufficient; the most serious trouble due to excessive wetness is weed suppression and the difficulty in preparing the soil well before planting.

### The Crop.

The crop consists mainly of Badila, some H.Q. 426, and a little Goru. At the outset this was forecasted to yield 190,000 tons, which is greater by some 12,000 tons than that milled the previous year, and the estimate still remains at that figure, although grubs, premature arrowing, and weevil borers more or less damaged or retarded the growth.

### Harvesting and Milling.

The end of the season is in sight. Ideal conditions for the greater part have prevailed for harvesting. Severely grub-damaged crops were harvested early; the lighter crops now are being fired before cutting. Operations in field and mill have progressed smoothly and well; there has been an adequate supply of cane, and in consequence record weekly tonnages have been treated, which has enabled the factory to treat a greater tonnage in a shorter time. The general quality of the cane has been good; 157,000 tons have been milled to 3rd November, and it is expected the balance of about 33,000 tons will have passed between the crushers by 7th December.

### Cultivation.

The long stretch of dry weather has permitted constant tilling, the area, generally speaking, is therefore cleaner and in a better order than previously. It is clear that the cleaner fields and their surroundings must, with the improved crop husbandry, result in an increased 1929 crop yield. The area on which the grub-destroyed cane was cut early was speedily ploughed and immediately replanted. Most of the plant cane was early planted, and its germination on the whole has been satisfactory.

*Drainage.*—Several growers have improved their canefields by draining.

### Fertilisers.

Our canegrowers are beginning to realise the great value of fertilisers, and also the benefits to be gained by early application. To secure a well-balanced plant foot mixture and one suitable for different canes and soils is always a problem. Cane and soil analyses, together with carefully laid out field plots, should afford some interesting and valuable assistance. Sufficient moisture to act as a solvent is required, so that it may be early assimilated by the roots. Fertilisers should be applied within three months from planting or cutting; two dressings, though more costly, are often better than one.

### Filter Press Cake.

The value of this spread over the less fruitful spots is not understood. It contains some lime and phosphates removed from the cane juices. Its scarcity, together with the cost of application and increased weed growth, are the main objections to its use. If weeds grow, so must the cane, and the faster it grows the sooner will it cover the interspaces. It is beneficial broadcasted over resting fields and mixed with the soil by subsequent cultivation. Increased plant germination and growth may be had by placing same in cane drill with seed. The use of too much must be guarded against.

### Diseases and Pests.

Leaf Scald was very bad in Gorn, bad in H.Q. 426, and was found in most Badila fields. The first-named cane has served its purpose in some places and should now be eliminated. Weevil-borer destruction is too severe, and is increasing in spite of the fact that its parasite is widespread at present, and is abundant. Trashed cane is more affected than is untrashed. Numerous beetles and larvæ were found in some perished and dissected cane stools. The flies are reduced in number when all the cane is harvested, so it is late before they increase sufficiently to offer much resistance, therefore the breeding of one of our most dreaded cane pests is interrupted but little. Quarter-acre patches of borer-infected cane should be permitted to remain throughout the district, and if done should insure a larger supply of early flies.

### WAUGH'S POCKET.

Most of the available cane for milling is harvested. The new crop, though possessing a good colour and making satisfactory progress generally, has not received any interspace cultivation, and in consequence the soil is now refractory. Leaf Scald and weevil borers have been noted, and the liberation of tachinid flies is recommended. Apparently there is much good soil in this district. The progress of this pocket is hindered owing to its not having a trafficable road.

Prospects for 1929 are promising at present for another good crop; but some rain is wanted to ensure its continuous growth.

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### TICK CLEANSING OPERATIONS.

Mr. W. Forgan Smith (Acting Premier and Minister for Agriculture and Stock) announced recently that tick cleansing operations were being carried out under a scheme in which the Commonwealth, New South Wales, and Queensland Governments were co-operating. Each of the Governments had appointed a representative to a committee that is known as the Cattle Tick Control Commission, and the first meeting of that Commission was held in March, 1927. This committee has been entrusted with the control of tick cleansing operations.

It was arranged that the tick cleansing operations would be commenced in New South Wales, the intention being that when that State is cleared of ticks, the work would be extended to Queensland.

Systematic attempts are now being made to eradicate the tick in the Northern Districts of New South Wales. The Minister stated further that the chairman of the Tick Commission, at a meeting held recently, mentioned that many stockowners were of the opinion that ticks were still being introduced into that State through tick-infested cattle in Queensland being allowed to run on country adjoining the New South Wales border, and the chairman suggested that a survey might be made of the country adjoining the New South Wales border for a distance of, say, five to ten miles, and particulars obtained as to the approximate number of cattle running on this area, in order that, at a later period, this portion might be dealt with. No action beyond that indicated above has been taken in this connection.

Immediately that the New South Wales territory is rendered free from ticks there will be full justification for Queensland to devote closer attention to the work of tick eradication within this State.

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## The Banana Weevil Borer in Java, with Notes on other Crop Pests.

By J. L. FROGGATT, B.Sc., Entomological Branch.\*

I have to submit the following report of my visit to Java to study the position of the banana weevil borer (*Cosmopolites sordida* Chev.) and to search for and, as far as possible, study any parasites of or predators on that pest, and if practicable to forward supplies of such to Queensland.

The report has been written in two parts, the first dealing with the subject of the banana weevil borer, and the second treating of matters relating to sugar, tea, coffee, &c.

Leaving Brisbane on the 26th May, 1928, I arrived at Batavia on the 11th June. After arranging financial matters and presenting my credentials to the British Consulate, I left for Buitenzorg the following morning, where I presented letters of introduction to the Director of the Department of Agriculture and Commerce, Dr. Barnard, to the Director of the Department Landbouw, Dr. den Berger, and to the Acting Director of the Institut voor Plantenziekten, Dr. van der Goot. At the Institut a room was very kindly given me and every facility offered for carrying out whatever investigations I wished to make. In reference to banana culture, &c., I was introduced to Heer Oehse, who extended me all facilities possible for obtaining the information desired, and also later made all necessary arrangements for supplying the bulbs of selected varieties of banana plants for introduction into Queensland.

After spending about a fortnight on investigational work in and around Buitenzorg, I arranged, with the advice and co-operation of Dr. den Berger, a trip through to Banjoewangi, calling at Bandoeng, Garoet, Paseroean, Malang, and Djoeja on my way. Through the courtesy of Dr. den Berger, the agricultural officers in each centre took me round their respective districts and supplied me with local information. Leaving Batavia on the 20th September, 1928, I returned to Brisbane on 4th October, 1928.

### PART I.

#### The Banana Plant in Java.

Bananas were found to be grown in all campongs, agricultural settlements, throughout the districts visited during my trip through Java, the fruit constituting one of the important foods of the natives. In only one section of the island—namely, the Banjoewangi area—are bananas grown for export, and even there they are grown by the natives and supplied at a fixed price per bunch to the exporter at the wharf at Banjoewangi.

It is not the general practice to set aside definite sections of the campongs for the growing of this fruit alone, and cultivation such as is carried out in Queensland was not observed anywhere.

The banana plant appeared to grow to the best advantage in situations where the ground was sheltered from the full force of the heat of the sun. Wherever it was growing in exposed situations, both the growth of the plants and the bunches from them were less prolific than where they were more sheltered.

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\* This article comprises the major part of a memorandum prepared by Mr. Froggatt on his return from Java.—R.V.

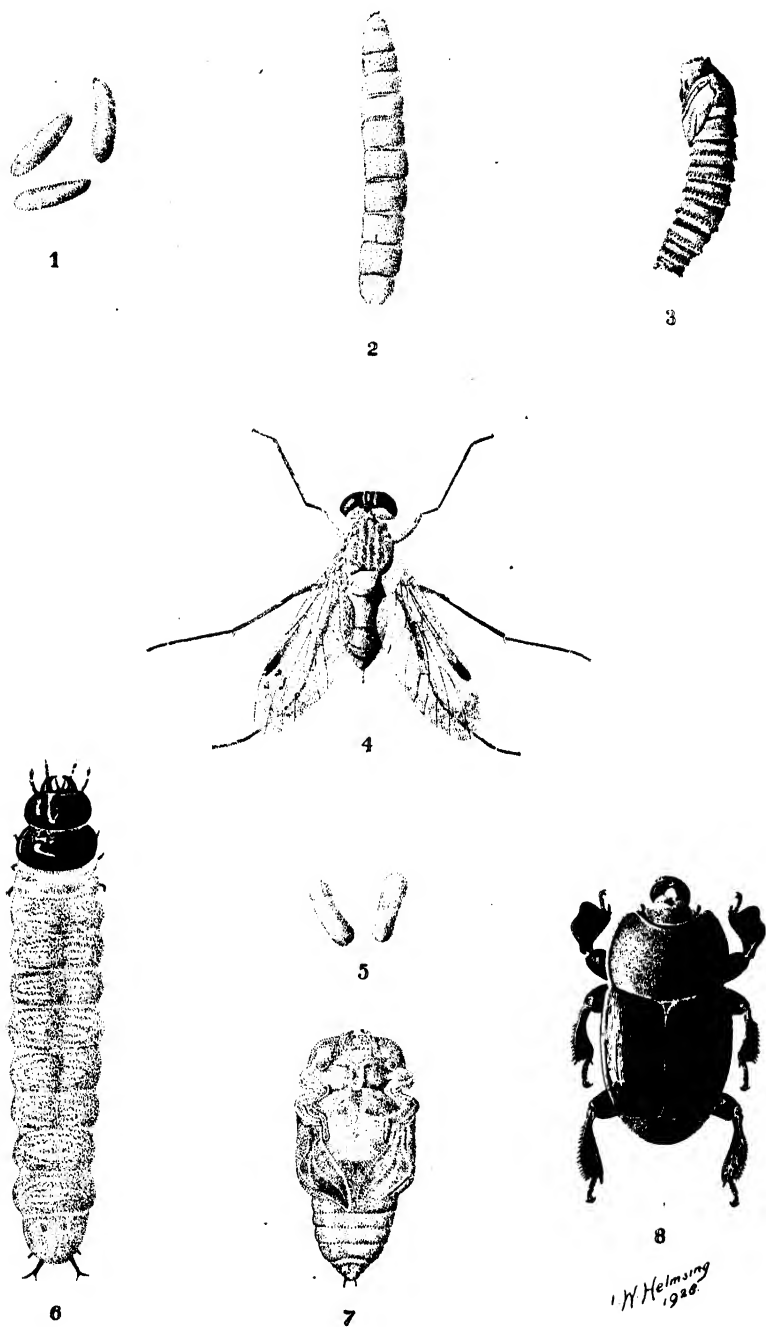


PLATE 147.—PREDACEOUS ENEMIES OF THE BANANA WEEVIL BORER IN JAVA.  
*Chrysopila ferruginosa* (Wied.).—1, Eggs,  $\times 15$ . 2, Larva,  $\times 3$ . 3, Pupa,  $\times 3$ .  
 4, Imago,  $\times 3$ .  
*Plaesius javanus* (Er.).—5, Eggs,  $\times 2$ . 6, Larva,  $\times 2$ . 7, Pupa,  $\times 2$ .  
 8, Adult,  $\times 2$ .

Although a number of varieties of bananas are known in Java, there are relatively few that are held in general favour for consumption by the Europeans. I was informed that the list of known varieties does not apparently represent all that are grown by the natives, as others are being recorded from time to time.

The banana, being so universally grown for local consumption, calls for no special attention as long as the supplies are adequate for the demand. Furthermore, if a plant becomes sickly it is very readily replaced; all that is required is to dig a shallow hole, into which a medium-sized plant, dug from a nearby stool, is placed, and cover the bulb over with soil and ram it firm. On account of no detailed study having been made of this crop, I was unable to obtain definite information on the time taken from planting to bunching, and from bunching to the cutting of the fruit, although it would appear that the full period is less than twelve months. This would, of course, show a variation with the age of the plant selected for planting, this depending on the fancy of the native; apparently there is, however, a variation due to alterations in the climatic conditions at different altitudes. Neither were data available on the length of economic life of a stool.

After a plant bunches, the stalk is either cut off a foot or more above the ground and then cut across into two or three pieces, these being piled against the standing plants, or it is half cut through and left hanging. The subsequent decay of the plant tissue is very rapid, especially in the moister districts of the island.

### The Banana Borers in Java.

There are two species of Curculionids breeding in banana plant material in Java, *Cosmopolites sordida* Chev. and *Sphenophorus planipennis* Gylh.

*C. sordida* breeds in the bulbs and cut stems, while *S. planipennis* apparently confines its activities to the stem tissue after the bunch has been cut or after the plant has died either as a result of attack by *C. sordida* or from other causes.

*C. sordida* apparently has similar, if not identical, habits to those recorded in Queensland. A very noticeable feature at Buitenzorg, where the climatic conditions were hot and humid, was the very slow rate of oviposition by this species. Very great difficulty was experienced in obtaining sufficient eggs for field testing for the presence of any possible egg parasites.

*Sphenophorus planipennis* oviposits in the ends of cut stems and in crushed portions giving an entry into the centre of the stem. The larvæ feed particularly in and immediately around the bunch stalk, and later spread through the tissue of the leaf bases. When full grown the larvæ form a relatively thick and tightly matted cocoon composed of the fibres of the leaf base tissue, pupation taking place after a period of quiescence (the prepupal period) inside the cocoon, which is usually embedded in the tissue of the leaf bases. The adult, after emergence, apparently lies comatose within the cocoon for a period before emerging into the rotten plant-tissue.

When newly emerged the beetle is a very light brown in colour with distinct black stripes along the thorax and elytra. The mature adult is a dull black.

*S. planipennis* is slightly larger than *C. sordida*, and is also much flatter on the dorsal surface, with the thorax showing two lines of

punctate markings. It is therefore readily distinguished in the beetle stage from *C. sordida*.

Field observations in the various districts went to show that up to approximately 1,000 feet altitude the activity of the borers, and especially of *C. sordida*, was comparatively slight, but at higher altitudes they were very much more active. This was most noticeable not only in the relative numbers of larvæ present in decaying stems but also in the relative amount of damage done. I was informed that this fact of the greater damage to banana plants by the borers at the higher levels had also been brought under the notice of the Institut voor Plantenziekten at Buitenzorg. Furthermore, at Malang, as a result of questions put to the head of one of the campongs by Heer de Vries, we were informed that the destruction of banana plants was more pronounced during the wet monsoon than during the dry monsoon. The wet monsoon is reported to be the cooler part of the year in Java. In the campong referred to a plant was found that had been so badly attacked by borers that it had snapped off at ground level as the bunch was being thrown. This campong was at an altitude of about 1,500 feet.

From the general information obtained, partly by report and largely by my own observations, it would therefore appear probable that the hot climatic conditions existing on the lower levels exercise a certain retarding influence on the rate of breeding of *C. sordida* at any rate, since we know that in Queensland the breeding of this pest is very greatly reduced during the summer months.

Both *C. sordida* and *S. planipennis* were met with in all districts visited in Java, and apparently attacked all varieties of banana plants in any one locality to a relatively similar degree.

No egg parasites of either species were found, but the larvæ of the Leptid fly, *Chrysopila ferruginosa* Wied, and the larvæ and adults of the Histerid beetle, *Plasius javanus* Fr. were proved to be predaceous on the larvæ and pupæ of both species of the borers in captivity. This is dealt with later under the account of these predators.

No detailed investigations have been made into the subject of the banana weevil borers in Java, and consequently no information was available at the Institut on their life histories, habits, parasites, &c.; neither has any work been done on measures for the control of the pest.

### **Predators other than *P. javanus* and *C. ferruginosa*.**

Possible predators other than *P. javanus* and *C. ferruginosa* on the borers are two species of Histeridæ, one or two species of Staphylinidæ, and two species of Hydrophyllidæ. These have not yet been specifically identified. Several species of Dermaptera ("earwigs") were fairly common in the rotting banana plant tissue, but no association was proved between them and the borer larvæ.

The smaller species of Histerid was fairly common in rotting banana material, and also in decaying sugar-palm and papaw stems. The larger species was received from the native collectors along with the adults of *P. javanus* and was collected in the rotting banana stems in the Buitenzorg area. This beetle was more active in its movements and took to flight more readily when disturbed than *P. javanus*, but in captivity was not nearly so voracious a feeder on borer larvæ as the latter species. No information could be ascertained on its life history, and the number received of the species in question was not sufficient to warrant its recommendation for closer study with the limited time available for the

general work. The other species of Coleoptera referred to above can, in the light of our present knowledge, be only considered as possible predators of relatively minor importance on the banana weevil borers.

With the exception of the larger species of Histerid, which was only taken in the Buitenzorg area, the other species referred to were found distributed throughout the districts visited.

### *Plaesius javanus.*

In reference to the distribution of this species, no detailed information was available from the records of the Institut voor Plantenziekten. I was informed that it was not known to occur in any of the outer possessions of the Dutch East Indies, but I found it to be generally distributed throughout those areas in Java which I visited. Owing to a combination of unavoidable circumstances, an examination in the jungle in East Java was not possible, but, in view of the fact that this predator is present all through the campongs in the surrounding areas, it is probable that it is also active in the jungle.

It may be stated that, except in the eastern part of the island, the jungle has been practically all cleared away to permit of the very intensive agricultural cultivation practised generally through Java.

*Plaesius javanus* was not present in the Buitenzorg area in very large numbers during the period over which collections for transportation to Brisbane were made. I was informed that at times it is, however, extremely numerous, thus pointing to a possible seasonal variation in its activities and numerical frequency. In the other districts visited, I found also that it was not as numerous as had been anticipated. The total number of beetles received from the native collectors was 5,757, with an average of 10.1 beetles per collector per day.

The adults (Plate 147, Fig. 8) were found in the tissue of rotten stems or bulbs, either standing in the stools or lying on the ground. The larvæ (Plate 147, Fig. 6) were more generally present in the rotting stems in which borer larvæ were, in most cases, active. Although not actually found devouring the borer larvæ or pupæ, they were often met with in such association with them as to definitely show that they had been actively predaceous immediately prior to being exposed. In captivity both adults and larvæ of *P. javanus* were extremely active in attacking the borer grubs. Neither stage, however, appeared to actively attack the adult weevils, although in one instance a newly emerged adult of *S. planipennis* was destroyed when enclosed in a petri dish with *P. javanus* adults for two days.

As there was no quick and ready means of distinguishing between the larvæ of *C. sordida* and *S. planipennis*, it was not possible to determine the relative degree of attack by the predator on these two species.

The egg (Plate 147, Fig. 5) of *P. javanus* was only collected on one occasion in a campong out from Solo, this being in a stem that had been half cut through and left hanging; in the crushed and decaying tissue where the cut had been made a single egg was found in close association with an adult of *P. javanus*.

A prepupa of *P. javanus* was collected on one occasion in a campong out from Malang in a semi-dry rotted stem. The larva had made a tangled mass of the fibres of the leaf bases, inside which it was lying dormant. In this instance the prepupal period lasted for seven days and the pupal period lasting from 2.3/8/28 until 17/8/28, the beetle being fully coloured by 21/8/28.

In captivity the adults of *P. javanus* were found to attack and completely devour the larvæ of the large Curculionid from palms (*Rhynchophorus ferrugineus* Olivier). This was rather remarkable, on account of the very great disparity in size between the beetle and grub. It may be stated that the beetle was sometimes dislodged at the first attack, but later was always able to obtain and maintain its hold.

In obtaining supplies of this predator for transportation to Queensland it was found impracticable to collect sufficient numbers of the predator myself. Consequently it was arranged, through the courtesy of the Acting Director of the Institut voor Plantenziekten, that the two senior native assistants should arrange for the collection by native boys while the sorting and packing was checked by myself. At first the price paid was 2½ cents (¼d.) per beetle, but it was found necessary to increase this to 3 cents, then to 3½ cents, and finally to 5 cents (1d.) per beetle, as the areas nearer at hand became effectively worked over. At the Institut the beetles were kept in tins containing damp moss, and in numbers not exceeding 300 per tin; weevil borer larvæ were placed in with them as supplies were brought in by the boys. During transportation from Java to Brisbane it was impossible to supply them with food, but the cases in which the tins were packed were carried, through the courtesy of the shipping companies (K.P.M. and Burns, Philp) and the ships' captains, as deck cargo, and were kept in as cool a situation as possible and stacked free from any risk of wetting by salt water. Under these conditions the rate of mortality was gratifyingly low in transit.

On arrival in Brisbane they were at first placed in damp moss in jars and fed on raw meat, on which they apparently feed fairly readily, and even more so after the meat had begun to putrefy. Portion of the beetles were later transferred to damp soil, and now all have been transferred to damp soil in tins. This was necessary, as the moss began to rot, and also became contaminated by the rotten meat which was dragged down by the beetles; furthermore, it was almost impossible to examine it satisfactorily for the presence of eggs. In an endeavour to supply them with insect food, Scarabæid larvæ have been obtained from Bundaberg through the courtesy of the Director of the Bureau of Sugar Experiment Stations, Mr. Easterby. These larvæ on being placed in the tins were readily attacked and completely devoured by the beetles. It is hoped that this food, more closely approximating to their natural food, may bring about the deposition of eggs, which, to date, has been known to take place in only a single instance.

The adults are highly predaceous on their larvæ in captivity, as also are the larvæ on one another, but it was not possible to determine to what extent this occurs in the field.

No parasites or predators on *P. javanus* were observed in Java, and none have been found to date on the beetles sent over. A series of dissections made of a small portion of these beetles failed to reveal any trace of any internal parasites.

The length of life of the larvæ is evidently very long. One larva that was not apparently very young when collected early in July pupated on the 12th November.

Owing to the difficulty of obtaining even sufficient food for the predators packed for shipment to Brisbane, the work of attempting to breed larvæ through at Buitenzorg had to be abandoned.

The adults evidently have a fairly long life; of the beetles collected over the period 25/7/28 to 17/8/28 there are a large number still alive and active. They will evidently live under fairly adverse conditions, as at Buitenzorg it was not possible to feed them to repletion, and then they were more than a fortnight without any food in transit. Furthermore, in Brisbane they have necessarily had to be fed on other than their natural food.

At present the rate of mortality of the *P. javanus* adults is very low, as also is the loss due to the exercise of predatory habits on one another.

### *Chrysopila ferruginosa.*

No detailed information was available on this species at the Institut voor Plantenziekten. I was informed, however, from another source that it had been collected in the Philippine Islands, Celebes, and Borneo, as well as Java. At the time of my visit the larvæ were very plentiful. In the wholesale collection of this predator, native collectors were also utilised, the price given per larva being first 5 cents (1d.), but when it was found to be so plentiful this was reduced to 3 cents; when the numbers received began to fall off early in September, the price was raised to 3½ cents each. The total number of larvæ received from the native collectors was 18,694, with an average of 11.5 larvæ per collector per day.

For transportation to Brisbane the larvæ (Plate 147, Fig. 2) were at first packed two or three together in small tins taken, and sent, over from Brisbane for the purpose, and containing damp moss with a little rotten banana plant material. When this supply of containers was exhausted, tins had to be bought locally; it may be stated that these were not the type which was considered to be the most suitable, but were the only type of small tin that was to be had. The most suitable type of tin was a small square or oblong one, the latter being not more than  $2\frac{1}{4} \times 3\frac{1}{4} \times \frac{7}{8}$  inches in size; the lid must be very close-fitting and should not be hinged.

The larvæ were packed in these latter containers at the rate of six per tin in damp moss, together with a little rotten banana material. On arrival at Brisbane it was found that some larvæ during transit had crawled out of these tins into the boxes in which they were packed; when the counts were made it was found that some of the larvæ that had managed to work their way out of the tins in the upper layers had also managed to crawl into tins in the lower layers, as many as thirty-two having been counted from a single tin. This habit of leaving the containers in transit is rather remarkable, because such was not observed while the tins were stacked on my table at the Institut at Buitenzorg; although lying there for twelve to fourteen days only a very occasional larva was found to leave the tins in which they were placed. It could not have been due to overheating, at any rate in the second and third consignments, for the system of packing the tins allowed good ventilation.

During transit the degree of pupation was almost negligible, and the rate of mortality of the larvæ was fairly high.

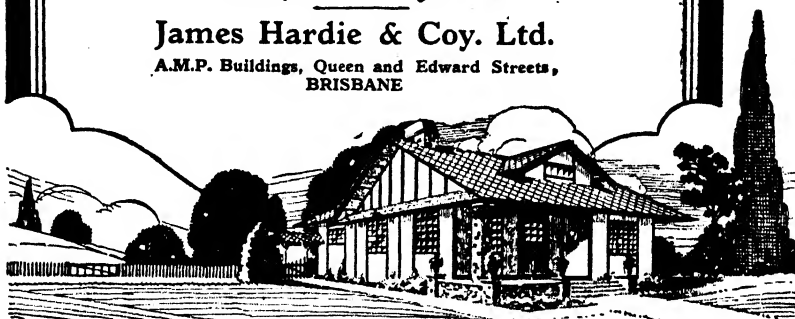
After being unpacked in Brisbane the larvæ were, as far as possible, kept singly in small glass jars and examined periodically for pupæ. When the supply of small jars was exhausted they were kept in lots of five together in larger jars and transferred to the smaller jars in singles as the latter became available. Within a few days of arrival there was a further mortality amongst the larvæ, and also subsequently amongst the pupæ. In so far as the mortality is concerned, this must, to a certain

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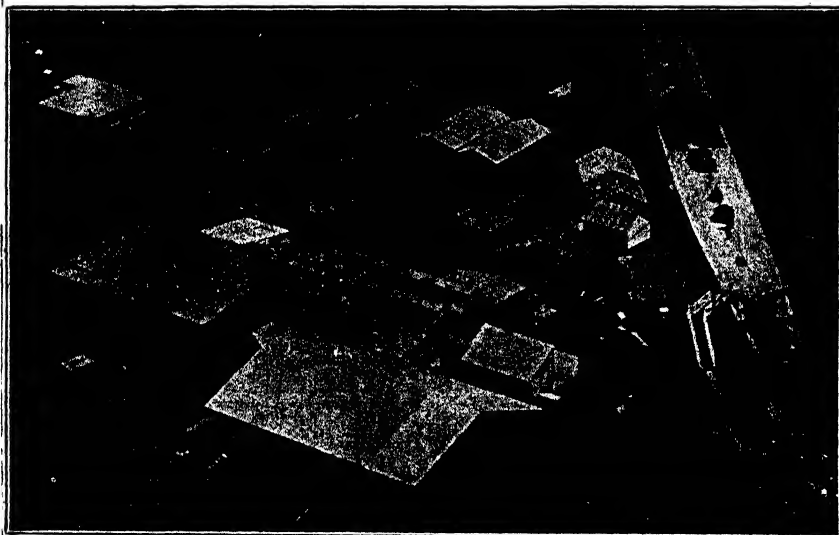
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extent at least, be anticipated, as the transport of the developing stage of the insect, unavoidably without food, and in an unnatural habitat must lead to a serious derangement of the internal economy of the larva; furthermore, under the nature of the system of collecting that had to be adopted some of the larvæ would not be fully developed when sent away, and would naturally not withstand the rigours of transportation so well. Small colonies of the flies have been liberated in plantations in the Cooran district, where there is a considerable area under banana cultivation in contiguous plantations.

At Buitenzorg a number of pupæ collected in the field were kept under observation, and the flies on emerging were placed in a small breeding cage, together with sections of cut banana stem in different degrees of decay. Food was provided by soaking cotton wool in syrup and placing the wet material in a dish on the floor of the cage. The flies fed readily both on the syrup and on the juices of the rotting plant tissue. In the act of feeding, the legs are spread well out from the body, which is then lowered horizontally almost on to the feeding surface; the proboscis is then protruded.

Oviposition took place readily in captivity, but in no case, unfortunately, did the eggs mature. As mating was not observed, it is therefore possible that the eggs (Plate 147, Fig. 1) were infertile. For oviposition, a crevice, or borer hole, in slightly decaying stem tissue was selected; the ovipositor was extruded and curved forwards underneath the body, while the tip, projecting into the crevice, was moved about for deposition of eggs. The whole act was found to occupy about four to five minutes. The eggs were laid in an irregular mass, numbering generally about sixteen, although as many as fifty-nine were counted in one mass. After completion of oviposition, the tip of the ovipositor is apparently cleaned by the tarsi of the hind legs before being retracted.

In captivity, the wings of the flies quickly become broken, due largely to the strong flight of the adults, which dart to the sides of the container, against which they hit with considerable force. It is thus difficult to keep them in captivity for close study. In the cage they usually lived for about seven days.

In the field the larvæ and pupæ of this species were taken in rotten banana stem tissue generally, but not always, in association with borer grubs. In some instances very young, and even well-developed, larvæ were found in such material in which there was little or no signs of borer activity, and in which no borer grubs or pupæ were present at the time of examination. There is no doubt but that the larvæ are predaceous, in very many instances at least, on both species of the banana borer grubs, but further study would be required to determine whether they can develop on a decaying plant diet alone, or are predaceous on other insect larvæ. In some instances it appeared at least possible that they were predaceous on Syrphid larvæ in rotten banana stems, and in one instance on Stratiomyid larvæ in a decaying papaw stem.

Owing to the difficulty of differentiating between the larvæ of the two species of banana weevil borers, it was not possible to determine the relative degree of attack on the grubs of the two species by the Leptid larvæ.

From pupæ collected in the field, a small Dipterous parasite (belonging to the family Phoridae) was bred on six occasions, the larvæ emerging from the Leptid pupa about ten to eleven days after collection;

the pupal period was about seven days. This is apparently a pupal, and not a larval, parasite, as this small fly was not bred from any larvæ kept under observation. As the total number of pupæ under observation was 411, the percentage of parasitism (1.46) was very low.

Before pupating, the larva (Plate 147, Fig. 2) apparently has a short prepupal period; when the pupa is fully formed the larval skin is cast off over the anal end of the pupa.

The pupa (Plate 147, Fig. 3) is fairly mobile on account of the ready movement of the abdominal segments and the ring of chitinous spines arranged around each segment. This habit may be exercised in nature to enable the pupa when nearly mature to approach close to the surface in the rotten mushy material for the readier emergence of the adult. (Plate 147, Fig. 4.)

The following is a brief description of the life-cycle stages of this species:—

*Egg*.—Pearly white; length 1.5 mm.; breadth .5 mm.

*Larva*.—Creamy white in colour; length about 30 mm.; width 3 mm. The most distinguishing feature of the larva is the elongation of the terminal anal segment of the body into four fleshy triangular-shaped lobes.

*Pupa*.—Reddish brown in colour; length about 25 mm.; breadth about 6 mm. Around anal segment are six spines, two ventral and other four more dorsal; around each segment is a row of small spines.

*Adult*.—Of a general brown colour with the tip of the abdomen much darker; the wings are well developed and are yellowish brown in colour and with one dark spot on the costal margin towards the apex. The sexes are readily distinguished by the shape of the abdomen, the males being much narrower in proportion to their length than the females.

Length of fly about 20 mm., width about 5 mm. over thorax, wing expanse about 40 mm.

It should be stated that in the notes made on the borers and the predators referred to, the observations can only be regarded as fragmentary on account of the limitation in time rendering impossible a complete study of the insects concerned; such would require at least many months of intensive study, both in the laboratory and in the field.

### **Pests Recorded from the Banana Plant or Fruit other than Weevil Borer.**

The worst pest of the banana fruit in Java is the caterpillar of the fruit moth (*Notarcha octosema* Meyr.). This is present throughout the island and causes more or less severe blemishing of the fruit on practically every bunch. Experiments have been carried out for its control by blowing Pyrethrum powder up under the flower bracts of the young bunches, but owing to the very tall nature of the plants of many of their banana varieties, this is slow and costly. In reference to results from this treatment I was informed that, although promising, the trials would have to be repeated before any definite conclusions could be drawn.

*Scirtothrips signipennis* (Bagnall) was collected on the stems and bunches at Buitenzorg, and *Thrips partirufus* Gir. was taken in bud ends at Bandeong and Buitenzorg. With more extensive collecting it is probable that both species would be found to have a general distribution through Java.

"Rust" (Thrips damage) was observed on a good deal of the banana fruit in Java, but was generally not severe. This is possibly largely due to the open nature of the hands of a large number of the varieties.

*Erionata thrax* (Hesperidæ) is fairly common, the larvæ rolling up sections of the leaf, inside which they develop.

The following insects were also recorded as banana foliage feeders:—

Hispidæ.—*Gonophora riffa* (surface order), *Botryonopa sanguinea* Cuen (eats holes in leaves).

Scarabæidæ.—*Adoretus* sp., *Exopholis hypoleuca* Wlk.

Lepidoptera.—*Drapetodes mitaria* Gn., *Euproctis virguncula* Wlk., *Prodenia litura* F., *Ypilosoma strigtula* Wlk., *Mahascna hocking* Moore.

## PART II.

### Introduction.

In the general systems of insect pest control a great deal of attention is being paid to biological lines of attack and also to improved agricultural practice.

In crops such as tea, sugar, or coffee for example, the areas under crop are so large and the difficulty of proper supervision of native labour carrying out any treatment is so great that any chemical measures of attack on the problems are largely impracticable. This is not to say that such lines of investigation are not being tested out, for such is not the case; but it was evident that such measures could not be utilised on a large scale in many cases, at least, under existing conditions.

Owing to the very close attention that had to be paid to the main problem of the study of the position regarding the banana weevil borer and the search for parasites and predators, the amount of time available for following the other lines mentioned in my commission was very limited. As far as time permitted I visited the various Proefstations and met their technical workers, who were always most willing to show and explain their work to me; unfortunately the time that could be devoted to this work was all too limited.

The information given on the general crops was obtained largely by conversations with the different workers and also partly from the literature published on these subjects.

### SUGAR-CANE.

The principal recorded pests of sugar-cane in Java are the stemborer, *Diatrea striatalis* Sn., the topborer, *Scirpophaga intacta* Sn., and the "White Louse," *Oregma lanigera* Zehnt. Of the last mentioned, a considerable amount of work has recently been done on the parasite of this species, *Encarsia flavo-scutellum* Zehnt.

Scarabæid larvæ are only bad in some fields, and these are usually poor soils; so far no measures have been attempted for their control. The worst species is *Holotrichia helleri* Brsk., which is a bad pest among many lowland crops; investigations have, however, only been recently begun into its life history, &c. Two species of Scoliid parasites, *Diels*

*thoracica* Fab. and *Diels annulata* Fab., are recorded on *H. helleri* (vide Bull. No. 13, 1915 Laboratorium voor Plantenziekten, De Cassava—Oerets, S. Leefmans).

From inquiries made from Dr. Hazelhoff, Paserooan, and Dr. van der Goot, Buitenzorg, *Rhabdocnemis obscura* is apparently not known in Java.

It is possible that under certain conditions *Plæsius javanus* may, in Queensland, act as a predator on this Curculionid and may also act as a predator on Scarabæid larvæ in the soil. The Leptid, if it can be established in Queensland, may also act as a predator on *R. obscura*.

### TEA.

There are a number of insect pests recorded from the tea plant; these are dealt with in Bull. IX. 1925, Mededeelingen van het Gouvernements Kina-Proefstation.

The tea Capsid (*Helopeltis antonii* Sign.) is the most serious pest of tea in Java. Dr. Menzel, the Entomologist to the Proefstation, has been devoting a considerable amount of study to the Braconid (*Euphorus helopeltidis* Ferriere), a parasite of the larva of this species. This Braconid is attacked by an Ichneumonid hyperparasite (*Stictopisthus javensis* Ferriere), thus rendering special precautions necessary in the field liberations of the parasite.

Investigations are also being made along the lines of improved agricultural practice to stimulate the growth of the plants.

*H. antonii* Sign. is reported to be worse in the region of Soekaboemi than in the Preanger area (Bandeong, &c.).

### COFFEE.

The worst insect pest of coffee is the berry borer (*Stephanoderes hampei* Ferr.). Hand picking of affected berries before the insects have reached full development and the use of parasites are the two lines of attack that are being worked on for the control of this pest.

The twig borer, *Xyleborus coffea*, also at times causes appreciable damage.

In the attempted control of the berry borer a considerable amount of work has been done with parasites imported from Uganda.

In the liberation of these parasites a node of the giant bamboo was taken and an auger hole bored through it in about the middle of the section. The parasited material was placed inside and the opening sealed with fine copper gauze. These containers were found to be very satisfactory for field use.

### CASSAVA.

The main pest of cassava is the mite, *Tetranychus bimaculatus* Harv., which attacks the foliage. This does not, however, appear to seriously affect the growth of the plant.

There are a number of species of Scarabæid larvæ recorded as feeding on undersurface portions of the cassava plant. These are *Leucopholis rorida* Fabr., *Lepidiota stigma* Fab., *Euchlora viridis* Roufr., *E. nigra*

Fab., and *E. pulchripes* Lansb., *Anomala obselata* Blanch., *A. anchoralis* Lansb., *A. aerea* Perty ?, *Brahmina pumila* Sharp., *Lepadoretus compressus* Web., *Adoretus sciurinus* Burmeister, *Holotrichia helleri* Brsk., *H. leucophthalma* Wied., *Popillia biguttata* Wied., and *Serica* sp.

The Scoliid parasites recorded from these are *Dielis annulata* Fab., *D. luctuosa* Smith, *D. tristis* Sauss., *D. javana* Lep., *D. thoracica* Fab., *D. formosa* Guérin, *Triscolia rubiginosa* Fab., a species of *Tiphia*, and unknown species of *Dielis*.

### MAIZE.

The leaf fungus (or lyer disease) *Sclerospora javanica* Palm. is the worst trouble experienced with maize in Java. *Heliothis obsoleta* occurs, but is not, so I was informed, a really serious pest of maize in Java. In a number of the islands of the outer possessions *Pyrausta salientialis* Snell is a serious pest of this crop, feeding in the upper portion of the stem, causing the death of the stalk, but it is not, so far, known to occur in Java.

### FRUIT PESTS.

Citrus is subject to attack by several species of scale insects (Coccidæ), while fruit flies (Trypetidæ) also have caused considerable damage to the crops.

The following species of Trypetidæ are recorded from Java:—

*Ceratitis capitata* Wied., *Riora musæ* Froggatt—on citrus.

*Bactrocera curcurbitæ* Coq.—on melons, &c.

*Bactrocera ferruginea* Fabr.—on mango, *Capsicum annuum*.

*Bactrocera caudata* Fabr.

*Dacus garcinie* Bezzi.—on *Garcinia dulcis*.

*Dacus umbrosus* T.—in large fruit such as the "Jack Fruit" (*Artocarpus integrifolia*).

A good deal of success was reported against *C. capitata* by the use of poison syrup baits hung in the trees. The baits comprised sodium arsenite, lemon juice, molasses, and a little sugar.

Citrus is subject also to "Collar Rot," special investigations into which are now being undertaken in the Citrus Experimental Garden out from Malang.

In conclusion, I wish to express my indebtedness to Dr. Barnard, Director of the Department of Agriculture and Commerce, Dr. den Berger, Director of Agriculture, Dr. van der Goot, Acting Director, and Dr. van Karshoven, Institut voor Plantenziekten, and Heer Ochse, Department Land bouw Buitenzorg, for their ready assistance to me in obtaining information and furthering the objects of my mission in every way possible, and to the Landbouw Consultants, Heer Koorenhof at Bandeong, Götz van der Vet at Solo, and Dr. Loos at Bandowosa, and Heer Woolf at Garoet, the Tuinbouw Consulents, Heer de Vries at Malang, for their assistance in showing me round their districts, and for the information so readily given, and to Dr. Hazelboff, Dr. Mensel, and the other technical workers for their courtesies in showing and so fully explaining their work to me.

## Flag Smut of Wheat.

By J. H. SIMMONDS, M.Sc., Plant Pathologist.

Serious loss to wheat from disease is fortunately not of frequent occurrence in Queensland. During the past season, however, a malady commonly known as Flag Smut has been found to be present which may account for considerable reduction in yield if precautions are not taken to minimise this loss. Flag Smut is a fungus disease caused by the organism known scientifically as *Urocystis tritici*. Although this disease has been present in Australia since 1868, there have previously been only two isolated records of its occurrence in this State, in the years 1906 and 1915.

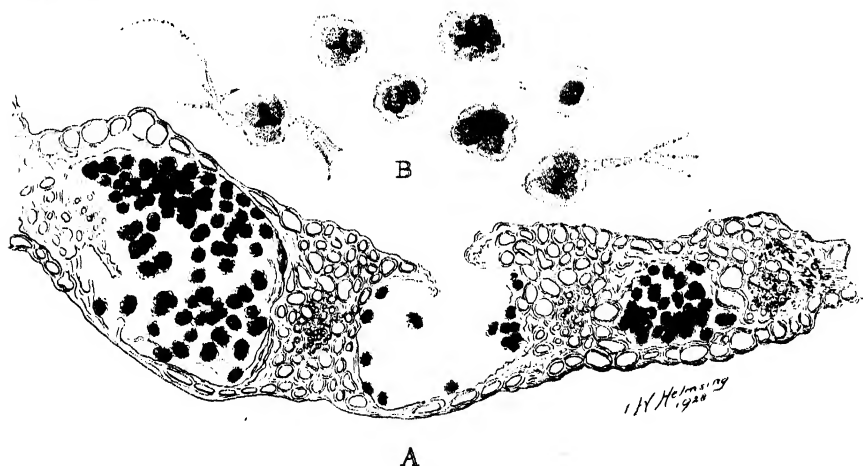


PLATE 148.

A field survey made by officers of the Agricultural Branch since the first discovery of Flat Smut this season has shown the disease to be fairly widely distributed throughout the chief wheatgrowing districts. It is probable that in some of the affected areas the disease was present the previous season, if not earlier, but not in sufficient quantity to come under notice.

In most crops examined the number of affected plants was small, and the loss would be slight; but in some fields, which may have borne infected crops the previous season, a loss of up to 20 per cent. had occurred. In Southern States, loss from Flag Smut is reported to vary from 5 to 70 per cent. of the crop.

In order that growers may recognise Flag Smut, and take what precautionary measures are possible for overcoming this disease, a description of the characteristic symptoms and a summary of the principal control measures are given below.

### Symptoms.

The first definite symptoms of Flag Smut appear as narrow greyish lines running up the leaf parallel with the veins. The lines are continuous or more or less interrupted. The streaking may be so closely



PLATE 149.

formed as to give a characteristic leaden colour to the whole leaf. (Plate 150, Fig. B.) The region of the grey streaks is usually slightly raised above the general level of the leaf, and in later stages may sometimes become ruptured along its length to expose a black sooty mass of fungus spores.

The presence of the fungus within its tissue usually stimulates the wheat plant to abnormal growth, with the result that the flag becomes twisted and wound about itself in a very characteristic manner. (Plate 151.)

A plant affected with Flag Smut remains stunted and deformed, and is usually unable to develop ears. In some cases it may be found that one or two stalks of a stool have produced normal ears, while the

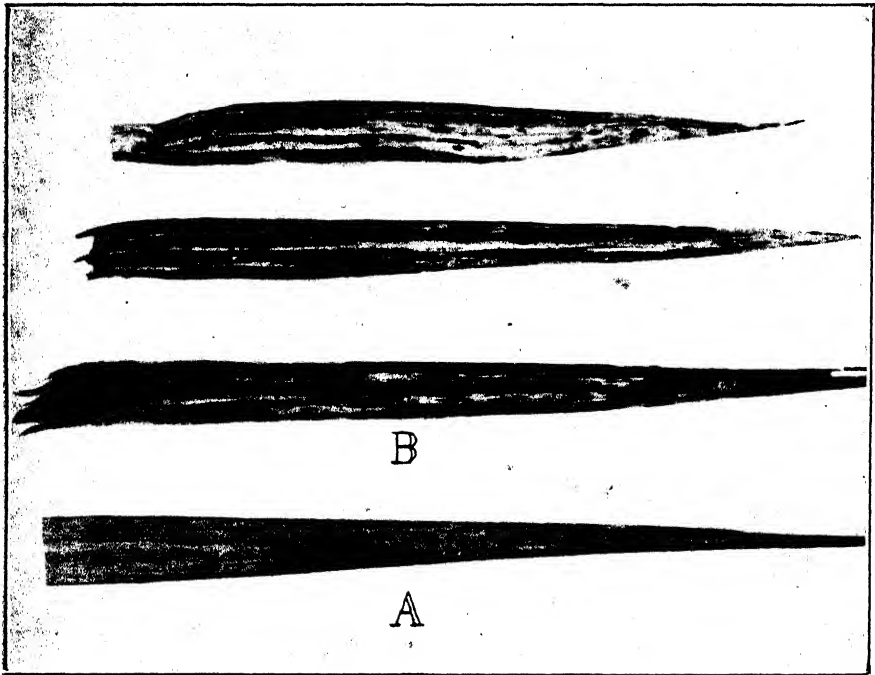


PLATE 150.

rest exhibit the stunted, diseased condition. Sometimes an empty and malformed head may be seen caught up in the twisted flag, or it may be free from this, but bearing, if any, only shrivelled grain.

The small, stunted or abnormal plants are not particularly conspicuous, and for this reason Flag Smut often may not be given its due place as a factor in producing a light yield. The quality of the grain that is actually harvested from a crop in which Flag Smut occurs is unaffected by the presence of the disease.

#### Cause.

Flag Smut is caused by a fungus (*Urocystis tritici*) allied to those other fungi responsible for smut diseases, such as, for example, Bunt and Loose Smut. This organism can readily be distinguished from the causal



fungus of the other wheat smuts by the characteristic appearance of its spores. These are minute rounded to oval dark brown bodies, and are surrounded by a layer of sterile bladder-like cells which are not found in connection with the spores of either Bunt and Loose Smut. (Plate 148.) It is these dark spores present in enormous numbers which produce the leaden-coloured streaks in an infected flag. They may lie singly, but are more commonly associated two to four together to form a cluster known as a spore ball.

During the ordinary routine of harvesting and cultivation the spores are liberated into the soil, or may contaminate the seed in the harvesting and threshing machinery. These spores when conditions are suitable will germinate by putting forth a short filament which typically branches to form two or three secondary spores. (Plate 148.) These sporidia, as they are called, may then produce a delicate thread-like germ tube which is able to penetrate the wheat plant when this is in the tender condition of the germination period before the shoots are above ground. The delicate colourless threads of the fungus then grow up through the tissue of the plant as this develops, and finally at the points represented by the grey lines develop from its branches the innumerable dark-brown spores mentioned above.

### Control.

A consideration of the life history of the Flag Smut fungus has shown that the wheat plant may be infected by spores which are contaminating the seed or by those already in the field, which have been derived from portions of flag-smutted plants left from a previous crop, or which have been introduced mechanically by the wind or on the person of men and animals. Seed contamination is the least serious, as the danger of Flag Smut arising by this means may be largely overcome by the ordinary methods of seed treatment. To free the land from infectious material is a rather more difficult undertaking, and to do so without causing some inconvenience is hardly possible. The following recommendations are designed to minimise the loss from Flag Smut:—

(1) Treat the seed with fungicides as for the control of Bunt. This procedure is imperative if the fields to be planted are still clean. If the field is badly contaminated with diseased material from a previous crop full benefit may not be obtained from the seed treatment—though this is still desirable—as infection may take place from spores in the soil. The standard methods of pickling can be followed.

For dry pickling, copper carbonate is used at the rate of 2 oz. to the bushel. This is applied by revolving the seed with the powder for several minutes in a box or other container in order to ensure thorough and intimate mixing so that each individual grain is completely enveloped in the fine dust. Where a gravity pickling machine is used the grain should be passed through at least twice. The less effective method of turning the seed over on the floor should be avoided. The dry process has the advantage in that germination is not impaired and the seed may be treated some time prior to planting.

The wet method consists of immersing the seed for two or three minutes in a solution of bluestone made up at the rate of  $1\frac{1}{2}$  lb. to 10 gallons of water. The seed is stirred in order that thorough wetting may take place and any bunt balls may rise to the surface and be

skimmed off. Only wooden or copper vessels can be used to contain bluestone solutions as this chemical will eat through iron. A somewhat inferior method sometimes employed consists in sprinkling the seed with the solution and turning it over until all the grains are thoroughly wetted. After treatment the seed is dried and then sown as soon as possible. If germination is delayed some injury to the grain may result from the use of bluestone, and when the seed is to be sown in a dry seed-bed it may be advisable, after treatment with the bluestone, to dip it for a minute or two in lime water prepared by dissolving 1 lb. of burnt lime in 10 gallons of water by which means the chance of reduction in germination is minimised.

(2) Whenever possible burn all stubble and straw as soon as harvesting is completed, as by so doing a large proportion of the spore-bearing material may be destroyed. Then fallow the land since the working of it will help to induce spore germination leading to death of the fungus in the absence of its host plant.

(3) A field that has borne an infected crop should be rotated for two years to crops other than wheat in order that the fungus may have time to die out of the soil. As the organism causing flag smut can infect wheat only, any other crop may be planted during this interval. The more cultivation the field receives during this time the better.

It is a wise plan to practise a certain amount of rotation even in fields in which Flag Smut has not been observed, since a slight infection may often occur which is easily missed during casual inspections. This may lead to successively heavier infections if wheat follows wheat every year.

(4) Avoid feeding stock on diseased hay and stubble as the spores of the fungus are able to pass through the animal uninjured and thus the disease becomes further distributed in the manure. Mechanical distribution on the feet of field workers and animals is always liable to occur and should be avoided as far as possible. Harvesting of badly affected fields should not take place during windy weather. Harvesting machinery after being used in a diseased field should be cleaned as thoroughly as possible before being taken into an uninfected field.

(5) Plant in a moist well-cultivated seed-bed as the chances are that many of the spores will by then have germinated and died. Avoid planting in a dry seed-bed, as spores and wheat then tend to germinate at the same time and infection is likely to result.

(6) Varieties of wheat differ in their relative susceptibility to Flag Smut. In an infected district it is therefore advisable to avoid planting varieties subject to the disease. Little definite information is available at present so far as Queensland is concerned, but it would appear that "Canberra" is definitely susceptible here as in other States, and the use of this variety wherever Flag Smut is prevalent should be discontinued.\*

#### Other Wheat Smuts.

It has been found that there is a certain confusion in the minds of some growers regarding the identity of the different smuts affecting wheat. Typical illustrations of Bunt and Loose Smut are therefore given in Plate 149 for comparison with Flag Smut.

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\* It is hoped next season to conduct a test of the relative susceptibility of all the varieties commonly grown in Queensland.

*Bunt or Stinking Smut* shows up in the mature ear when in place of the normal grain there is formed merely a shell filled with a black evil-smelling mass of fungus spores (Plate 149, Fig. B). This compact mass of spores is known as a bunt ball. When these are crushed so as to liberate the spores on to seed wheat, infection of the germinated seedling may take place as in the case of Flag Smut. Bunt may be readily controlled by the seed treatment mentioned above, since contaminated soil is not the frequent source of infection as it is in the smut disease just described.

*Loose or Flying Smut*, like Bunt, affects the ear, but in this case shows up at flowering time. The fungus forms a sooty mass of spores in the ovary and other floral organs and no grain is formed (Plate 149, Fig. A). The spores are readily blown away by the wind, and if they should lodge on a healthy flower head they are liable to germinate there and penetrate the developing ovary. The fungus then remains within the grain in a dormant condition until the seed is planted, when it commences to grow up within the developing wheat plant and finally forms its spores in the flower head.

Since the fungus is present, well protected within the tissues of the grain, the seed treatment used for Bunt and Flag Smut is ineffective in the case of Loose Smut. To reduce the loss from the latter disease it is therefore necessary to obtain seed from a crop in which Loose Smut is not present, or else use a hot water treatment in which the temperature is such that the fungus is killed but the wheat itself remains uninjured. This latter procedure is, however, somewhat troublesome for the average grower to adopt. Jensen's modified hot water treatment consists in presoaking the seed for about five hours in tepid water, when it is then immersed for ten minutes in hot water held at 129 deg. Fahr. (54 deg. C.). The temperature of the water during this process should not vary above 131 deg. Fahr. or below 124 deg. Fahr., but should be kept as near as possible to 129 deg. Fahr. by the addition of hot or cold water. At the upper limit the grain may be injured while at the lower the fungus is not killed.

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### CONTROL OF FLAG SMUT IN WHEAT.

Flag Smut is caused by a fungus which attacks the wheat plant at the time of germination and then grows through the tissue as the plant develops, causing a deformity and stunting of the flag, so that a normal ear rarely develops. A diseased plant may be readily picked out by the appearance of the flag, which is variously contorted by twisting about itself, and exhibits streaks of a grey or leaden colour running up its length. These streaks are due to the production of innumerable fungus spores within the tissue.

The Minister for Agriculture expressed concern at the prevalence of this disease in the wheat crops harvested on the Darling Downs this season. The situation called for immediate action on the part of the growers concerned, and to assist them the Minister made available the following recommendations for the control of this serious disease. These recommendations have been drawn up by the Plant Pathologist of the Department (Mr. Simmonds) and are those generally believed to be effective for the control of this disease provided they are enthusiastically adopted by the growers as a whole. The Minister, however, stressed the necessity for enthusiastic action on the part of the growers, for the success of any campaign rests very largely in their hands.

The following measures should be adopted by growers whose farms are at present free from infection:—

- (1) Obtain seed from a district where flag smut is not known to exist, and as an additional precautionary measure treat the seed with a fungicide as for Bunt.
- (2) Practise a rotation to other crops after wheat for at least one year in order to give a better chance for the fungus to die out of the soil should an infection have occurred too slight to be noticed.

Where infection has already been established the action to be taken is as follows:—

- (1) Burn all stubble and straw as soon as possible after harvesting is completed, and then fallow the land as the working of it will help to induce spore germination, leading to death of the fungus as no suitable host is available.
- (2) Avoid feeding stock on diseased hay or stubble, as the spores may pass through the animal uninjured and thus become further distributed in the manure. Mechanical distribution on the feet, &c., of field workers and animals is always liable to occur, and should be avoided as far as possible.
- (3) Rotate an infected field for two years to crops other than wheat. The more cultivation the field receives during this period the better.
- (4) Disinfect all seed used with the copper carbonate or bluestone and lime treatment, as recommended for the control of Bunt.
- (5) Plant late and in a moist seed bed as the chances are that many spores will by then have germinated and died out. Avoid planting in a dry-seed bed, as spores and wheat then germinate at the same time and infection is likely to result.
- (6) Distribution of flag smut by use of harvesting machinery which has previously been used on a diseased crop is a danger which should be avoided as far as possible.

Certain varieties of wheat have shown decided susceptibility to flag smut in other States of the Commonwealth. Should some of the Queensland grown varieties be proved susceptible to this disease, their use in districts where flag smut is prevalent should be avoided.

### A NEW I.M.S. CHAMPION.

"Evelyn of Sunnyview," 9412, Vol. 2 I.M.S., has gained the title of Australian I.M.S. champion junior two-year-old.

She commenced her test at two years and three and a-quarter months of age and produced 10,429.68 lb. of milk containing 567.624 lb. of fat in 273 days, exceeding the record made by "Gentle 6th of Greyleigh," the former champion, by 76.06 lb. of fat.

That "Evelyn" combines the type and character of her breed is evidenced by her successful career in the show rings, securing her first blue when barely seven months old in the class for heifers under twelve months. This success was followed up by gaining blues at Kingaroy, Murgon, Kilkivan, Maryborough, Gin Gin, Bundaberg, Rockhampton, and Gympie, and fourth in Brisbane Royal, in class under twelve months.

In class one year and under two years she continued her success by winning blues at Kingaroy, Wondai, Murgon, Maryborough, Childers, and second at Gin Gin, Bundaberg, and Gympie. She also gained champion honours at two and reserve champion at three shows.

In class sire and progeny she was one of a group that was placed first twelve times, and in class for pen of dairy heifers was placed first nine times.

Show ring honours were added to by her securing four first prizes in milking competitions.

The new champion is by "Diamond of Greyleigh" 297, I.M.S., who is a grandson of "Fussy's Pride of Hillview," 302, I.D.C., N.S.W., being by "Foch of Greyleigh," 33, I.M.S.H.B.

Her dam is "Snowdrop of Sunnyview," 4219, I.M.S.H.B., by "Young Victor."

"Evelyn" was bred by and is the property of Mr. Joseph Phillips, Sunnyview, I.M.S. Stud Farm, Wondai.

## LESSONS ON POULTRY FOR JUVENILE CLUBS.

*These lessons, which will be issued in three sections, have been designed to meet the requirements of Juvenile Poultry Clubs.*

*Section 1 has been prepared with the object of covering the first section of Juvenile Club work, which embraces the care of pullets.*

*Section 2 will deal with the care of laying stock, which is the second phase of Club work.*

*Section 3 will embrace breeding, the third and final stage of Juvenile Club work.*

*The scheme of Poultry Club organisation provides for Juvenile, Senior, and Adult Clubs.*

*A further series will be prepared for Senior and Adult Club work.*

### Lesson I.

#### HOUSING.

To obtain the best results from poultry, good housing is as necessary as good stock, good feeding, and good management.

*Essentials.*—Correct ventilation, freedom from draughts, freedom from moisture; sufficient room for the comfort of the birds.

*Design.*—Poultry houses may be built of a variety of shapes, but they should always be open-fronted. They should be constructed so that a space of 3 inches is left between the top of the back wall and roof, to provide for ventilation.

In building a new house the following photograph should be closely followed in design.

*Site.*—Poultry houses should be built on well-drained land. Positions with gentle slopes to the north and north-east are ideal. Wet and damp houses are cold and unhealthy.

*Material.*—Timber, free from cracks and crevices, and galvanised iron are most suited for building poultry houses. The walls may be made of galvanised corrugated iron, kerosene tins, timber, or sacks whitewashed. The roof should always be iron and, as cracks and crevices harbour vermin, iron is most suitable for the whole structure.

*Size.*—Where a netted run is attached to a poultry house, 2 square feet of floor space per bird should be allowed. As Club members only have a few birds, large buildings are not necessary.

A house 4 feet by 4 feet will accommodate six hens and a rooster. The house should be 4 feet high at back and 4 feet 6 inches high in front.

A lower roof would make the house too hot and more difficult to clean out.

*Construction.*—Houses should be built to face north or north-east, to protect from rain and wind, and to admit the sun's rays during winter. Greater protection from rain is given by projecting the roof in front or by building a small veranda.

The walls should be solid to prevent draughts. Where slabs are used for walls, the interstices should be covered by laths.

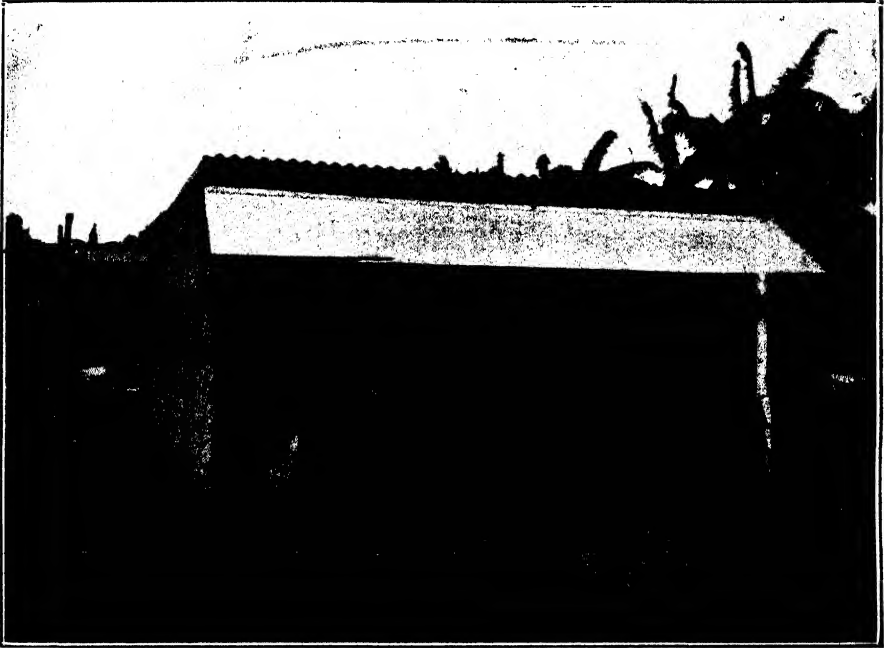


PLATE 152.

*Quantities.*—The iron and timber required for building a house as per plan is as follows:—

3 in. by 2 in. hardwood for corner posts—Two 5 ft. 6 in., two 6 ft.

3 in. by 1½ in. pine battens for roof, back, and ends—Six 4 ft., two 5 ft. 6 in.

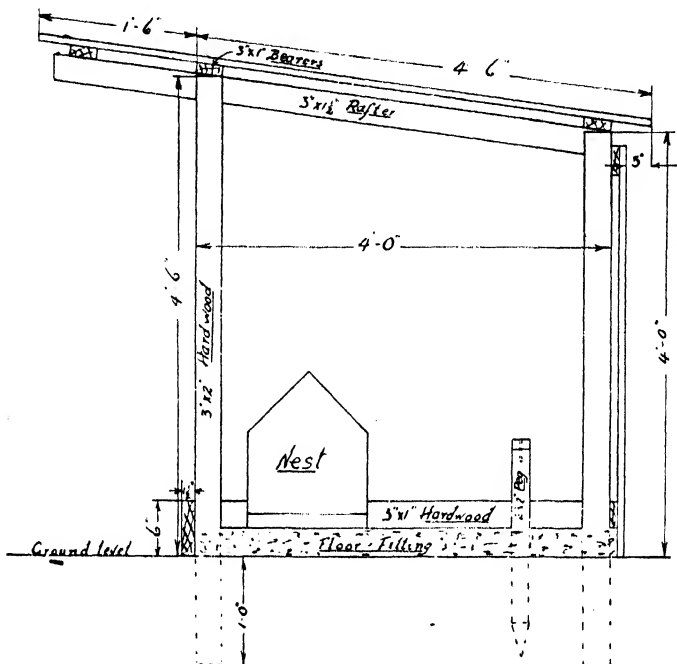
6 in. by 1 in. hardwood for front of house—One 4 ft.

Iron.—Roof, two 6 ft.; back, one 8 ft.; ends, two 9 ft.

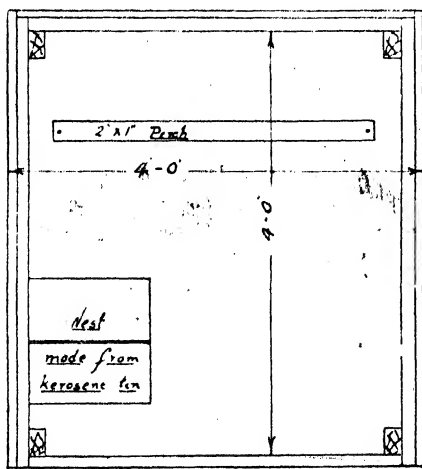
This material would cost about £2. Second-hand iron would reduce this expenditure.

*Floor.*—The floor of the house must be dry and hard, to have good sanitary conditions. Concrete floors are most desirable. Good hard floors can be made by using ant bed, well wetted and tamped. In order to ensure dry floors, raise them above the level of surrounding land.

*Fittings.*—In a house, perches and nests are necessary. The perches should be set up on pegs and made movable, as shown in plan. They should be erected 10 in. to 1 ft. from the back wall, and about 10 in. high. The nests should be placed in a shaded convenient position of the poultry house prior to the birds commencing to lay.



— Section —



— Ground Plan —

Drawn by J.B. 6.1.28

*Netted Runs.*—Fences should be 6 ft. high and posts 12 ft. apart. The bottom of the netting should be buried to a depth of 6 in. or well pegged down. The size of the run depends upon the numbers kept in any one flock. Always endeavour to have it large enough to prevent the roots of grass being eaten out. Where this is impossible, have two runs so that one may be dug over and planted with some gross feeder, such as rape.

## Lesson II.

### THE REARING AND FEEDING OF PULLETS.

#### CARE ON ARRIVAL.

When club members receive their stock they will be about eight weeks of age, weaned from the brooder, and will have learnt to perch. Young stock do not take kindly to changes, and the habit of perching is often forgotten when the birds are shifted to new quarters.

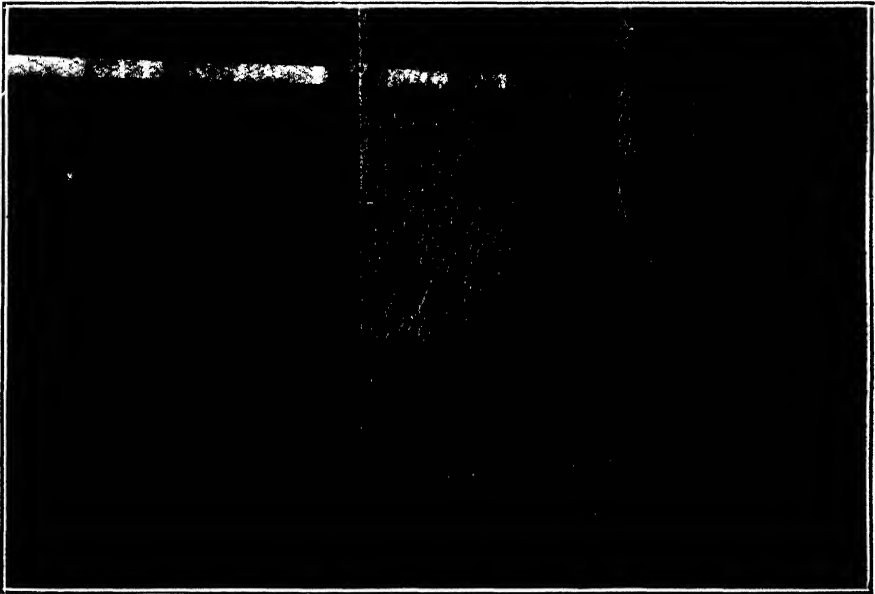


PLATE 154.

An illustration of how to bed chickens down, the straw being well banked up in corners.

Young stock that are not perching and have no brooder generally crowd into corners, with the result that some are smothered. Until the habit of perching is again acquired, place a good layer of dry straw on the floor, banking it well into the corners, for a bedding. Fork the straw over daily, shaking the droppings off the top and loosening the bedding for the birds to nestle in.

#### FACTORS AFFECTING GROWTH.

Ample range, feeding, clean water, cleanliness, separation of sexes, and vermin.

*Range.*—Stock on unrestricted range obtain large quantities of insect life, thus reducing cost of feeding. They consume freely of the tender shoots of grass. They have plenty of exercise, which assists in development. On free range, as a rule, good shade is available, and the land on which they run is not so foul as when they are penned.

*Feeds.*—All feeds contain moisture, ash, protein, fat, carbohydrates, and fibre in varying quantities. The body of the fowl contains similar substances in more definite proportions. In feeding it is essential to supply these substances in the quantities necessary to obtain good development.

*Use of Food.*—The food consumed by all growing animals is used—

1. To build up flesh.
2. To supply heat and energy.
3. To build up bone.

*Proteins.*—Proteins are organic compounds of carbon, hydrogen, oxygen, nitrogen, and sulphur.

*Carbohydrates.*—Carbohydrates are compounds of carbon, hydrogen, and oxygen.

*Protein.*—This substance is essential for the growth of flesh. Skim milk, lean meat, and insect life are rich in protein.

*Carbohydrates and Fats.*—These substances supply the heat and energy of the birds. One part of fat is equal to  $2\frac{1}{4}$  parts of carbohydrates. Maize is rich in fat and carbohydrates.

*Ash.*—Among the ash from any food burnt is the mineral matter necessary for bone development. Foods rich in ash are skim milk, lucerne, and bonemeal.

#### COMPOSITION OF SOME POULTRY FOODS.

##### DIGESTIBLE NUTRIENTS.

Food.	True Protein.	Fat.	Carbo-hydrates.	Fibre.	Nutritive Ratio 1:1
Maize .. .. .	6.2	3.5	65.8	1.8	12.1
Wheat .. .. .	9.5	1.3	62.2	1.1	6.9
Kaffir corn .. .. .	6.8	0.9	56.2	0.8	8.7
Bran .. .. .	11.6	1.8	40.5	3.3	4.1
Pollard .. .. .	11.9	3.1	54.0	2.1	5.3
Lucerne chaff .. .. .	10.3	0.7	27.7	8.4	3.6
Milk (skim) .. .. .	3.6	0.1	4.9	..	1.4
Buttermilk (powder) .. .. .	32.5	1.1	49.1	..	1.6
Meat meal .. .. .	42.0	7.0	4.5	..	0.5

The above table shows a great variation in constituents of different foods.

*Feeding.*—Experience teaches that about one part of protein is required to every four parts of carbohydrates and fats to obtain good development in poultry; that is, a nutritive ratio of 1 to 4 is required.

Maize has a nutritive ratio of 1 to 12, and if this grain is the only food given to poultry they will not make sufficient muscular development or good bone development.

One pound of maize fed in conjunction with 4 lb. of skim milk would give a nutritive ratio of 1 to 4.6. This food in addition to insect life would make a good ration.

*Nutritive Ratio.*—The nutritive value of a ration is ascertained by multiplying the fat content by 2.25, adding to the result the carbohydrate and fibre content, and dividing by the amount of protein.

Example—	Protein.	Fat.	Carbo- hydrates.	Fibre.
1 lb. Maize contains .. .. .	.062	.035	.658	.018
4 lb. Skim milk .. .. .	.144	.004	.196	..
	.206	.039	.854	.018

Fats .039 x 2.25 = .087

Carbohydrates = .854

Fibre .. = .018

— .959

Ratio of Protein to Carbohydrates = .206 : .959

or = 1 : 4.6

*Quantities.*—With correct feeding there is no danger of giving birds too great a quantity. It is possible to make a ration of any desired ratio with one or two foods. A variety of foods should, however, be used in order to increase the palatability of a ration. The more palatable a ration is, the greater the consumption will be. If the ration is correct, increased consumption will lead to increased development.

*Mash.*—Mash is a term applied to a mixture of ground foods fed either in a wet or dry state. A suitable mixture for pullets under twelve weeks of age is 8 lb. bran, 12 lb. pollard, 1 lb. powdered buttermilk, 1 lb. bonemeal, and 2 oz. of fine salt.

From the age of 12 weeks to the laying stage the buttermilk may be replaced with meat meal and 3 lb. of lucerne meal added to the above quantities.

*Skim Milk.*—If ample supplies of skim milk are available, there will be no need to add powdered milk or meat meal to the ration.

*Feeding Mash.*—All mash foods must be fed in suitable receptacles. When wet mash is fed, it should be made crumbly (not sticky) and placed in dishes. In feeding wet mash, only quantities that will be consumed in half an hour should be given at one time.

When mash is fed in a dry state it is placed in hoppers and is constantly before the birds. The practice of dry-mash feeding ensures that the birds are receiving all they require.

*Feeding Grain.*—Grains are better fed during the evening at a fairly regular hour, say 4 to 4.30 p.m. The feeding of grain at this hour enables the birds to obtain a full supply of food of a slow digesting nature.

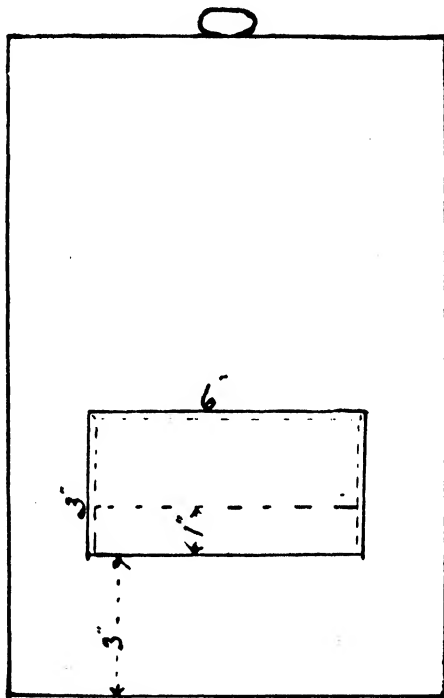


PLATE 155.—DRY-MASH FEEDER.

A simple method of making a dry-mash feeding-vessel for a few growing pullets from a kerosene tin is to cut a hole 6 in. x 3 in. in one side, as shown in the sketch. All cuts to be made on dotted lines and the edges turned to prevent injuring the bird. That portion below the bottom dotted line to be rolled inside to prevent the food being scratched out. For matured stock a larger hole would be necessary.

Variety is desirable in the grain fed to poultry. A mixture could be made of cracked maize, wheat, and hulled oats. Hulled oats are fairly expensive, and in places unobtainable. Feterita and cracked maize could be extensively used and probably grown by club members.

*Green Feed.*—Green feed is rich in mineral salts. It assists in maintaining stock in good health, and supplies mineral matter. Use only young succulent growths for fowls. Rape, lucerne, barley, cabbage, lettuce, &c., all make suitable green foods.

*Grit.*—Grit is absolutely necessary for birds at all times, and particularly so when confined. It assists in supplying mineral matter and also is used in the gizzard for the purpose of food mastication.

*Drinking Water.*—Fowls drink frequently and use a good quantity of water throughout the day. In drinking, they immerse the beak and

soon dirty the water. The water should be renewed at least daily, and kept in a cool shaded position.

Drinking vessels for very young stock should be constructed so that there is no possibility of their being drowned.

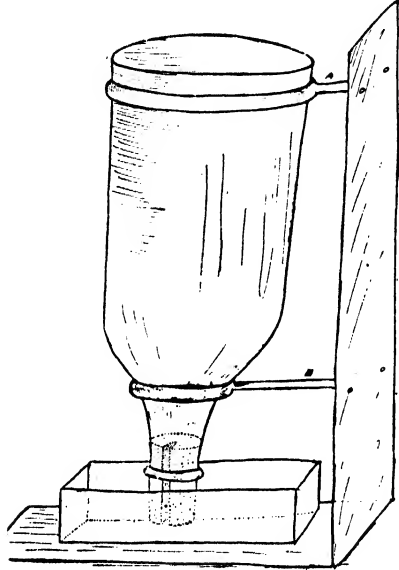


PLATE 156.—ROUGH SKETCH OF INVERTED BOTTLE AND TIN FOR WATER SUPPLY TO YOUNG CHICKENS.

The bottle is supported by means of two hoops of wire or hoop iron at A and B to a piece of light pine. The upright is nailed to a foot on which rests a shallow tin where the chickens can drink. A sardine or tobacco tin serves well. A cork, having a V piece removed its entire length allows, when the water in the tin has fallen below the level of the mouth of the bottle, the entrance of air thereby replenishing the water supply.

*Exercise.*—Exercise is necessary for good development. When birds are confined to a small yard, litter such as straw, grass, leaves, &c., should be strewn on the ground for them to scratch among. To induce exercise, grain should be fed in this litter.

*Cleanliness.*—Cleanliness is a most important feature. Houses should be cleaned out weekly to prevent the atmosphere becoming objectionable. Weekly cleaning will assist in checking vermin infestation. Weekly cleaning, if thoroughly done, will indicate the presence of many varieties of vermin when, if prompt action is taken for their eradication, they will cause little ill effects.

The water vessels should be cleansed daily, as they are a source by which disease is easily transmitted from bird to bird.

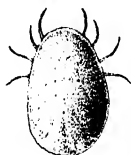
*Separation of Sexes.*—As early as it is possible to distinguish males from females, they should be separated. This is possible with stock between the ages of six and eight weeks. Cockerels could then be forwarded to market, or retained until greater development had been made. The cost of feeding and market values for table poultry must govern what action is taken.

**Adult Tick:**

*Adult tick feeds on bird at night.*

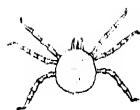
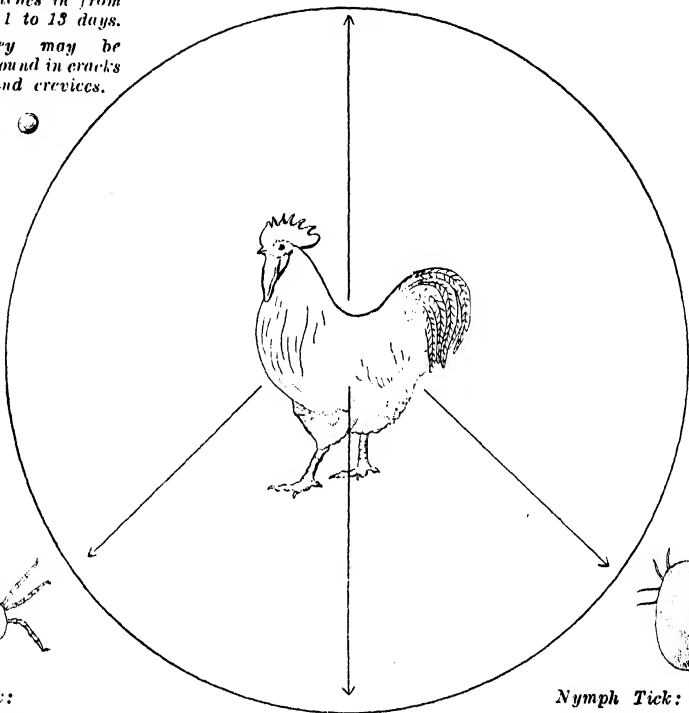
*It lays from 20 to 100 eggs at one time.*

*It may lay at eight different times.*

**Egg:**

*Hatches in from 11 to 13 days.*

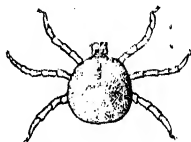
*They may be found in cracks and crevices.*

**Seed Tick:**

*Seed tick when hatched is white in colour.*

*It has six legs.*

*It attaches itself to fowl to feed.*

**Engorged Seed Tick:**

*Leaves fowl after feeding from 4 to 10 days.*

*It is then bluish-grey in colour.*

*It seeks shelter in cracks and crevices and then moults.*

**Nymph Tick:**

*It is called a nymph tick after moulting.*

*It now has eight legs and lives in cracks and crevices.*

*It feeds on the bird at night and then moults.*

*This process is usually repeated three times before the tick is fully grown.*

**Lesson III.****EXTERNAL PARASITES.****Principal External Parasites.**

Feed on blood .. ..	{ Poultry tick Red mite
Feed on skin and feathers .. ..	Body lice of all kinds.

**POULTRY TICK.**

The tick passes through many stages before reaching maturity. The life cycle of the tick may be briefly described as follows:—

1. The adult female lays eggs in batches of 20 to 100.
2. Eggs hatch in eleven to thirteen days according to climatic conditions.
3. Young tick (seed tick) attaches itself to the fowl, where it remains from four to ten days.
4. After engorging, the seed tick leaves the fowl.
5. After moulting, the seed tick is known as a nymph tick. It feeds again and moults. This process is repeated usually three times.
6. The female tick when fully grown feeds and lays. It may lay as many as eight batches during its life, but feeds between each laying period.
7. The time occupied in passing through all these stages is usually about ten months.

*Appearance.*—The tick egg is about half the size of the head of a small pin, circular in shape, shiny, and almost colourless. With age it turns a yellowish brown. The seed tick, before feeding, is naturally very small and almost white in colour. It has six legs. After feeding, the tick swells up considerably and is darkish in colour. It still has six legs. The nymph and adult ticks can easily be distinguished by their elongated oval bodies and size. They then have eight legs. When unengorged they are of a dirty yellowish colour, but after feeding they become bluish grey.

*Habit.*—The seed tick, on hatching, makes its way to the fowl and attaches itself under the wing or leg to feed. This feed may last from four to ten days. On feeding, it leaves its host and secretes itself in cracks and crevices, and moults.

The adult tick and nymph tick may be found hiding in the cracks and crevices of perches, under the perch, in woodwork of poultry house, bark of trees, fowl crates, and, in fact, any place where poultry are kept.

The tick, after its first moult, that is, when it has eight legs, only passes onto the fowl for an hour or so during the night for the purpose of feeding.

*Effect.*—The poultry tick, by sucking the blood from the fowl, weakens it and reduces the egg yield. It also frequently transmits to poultry a disease known as tick fever. Tick fever is responsible for

heavy mortality. This fever causes a rise in temperature of the bird, diarrhœa, loss of appetite, ruffled plumage, darkening of the comb, and, in many cases, the loss of the use of limbs before the bird dies. Some birds recover from this disease and are immune to future attacks.

*Treatment.*—Ticks must be destroyed, as treatment for tick fever is impractical. Thorough spraying of fowlhouses at intervals of five days, until the ticks are eradicated, is necessary.

*Spraying Mixture.*—The spraying mixture that is most economical and efficient is kerosene emulsion. This is made as follows:—Take 1 gallon of water and boil with 1 lb. of good household soap. When boiling remove from the fire and stir in 1 gallon of kerosene. Do this gradually and so get a good emulsion. To this then may be added another 8 gallons of water. In making this spray, use only soft water and, in using the mixture, spray freely.

*Longevity of Ticks.*—The length of life of the poultry tick is an unknown quantity. Cases have been known of isolated ticks living without feeding on a host for four years and five months. From this it will be seen that it would be most difficult to starve ticks out.



PLATE 158.—RED MITE.

#### RED MITE.

*What it is Like.*—The red mite is very minute. When fully grown it is not much larger than the dot used for the marking of the letter “i.” Adult mites have eight legs. They are red in colour when engorged with blood, but before feeding they are white. It only takes eight days for the mite, from the time it leaves the egg, to become fully grown; and, as a mite may live for four months, it will be understood that they multiply very rapidly under favourable circumstances.

*Habits.*—The mite lives in the cracks of perches, between the perch support and perch, in cracks of the nest boxes, walls of houses, and,

when very numerous, among the droppings and litter in the fowlhouse. They feed on the bird at night by sucking blood, and seek shelter before daybreak in secluded positions.

*Effect.*—Mites are responsible for reduced egg yields among laying hens on account of the loss of blood, irritation, and broken rest they cause. Young stock, when attacked by mite, do not thrive, and the health of all classes of birds is impaired to such an extent that they fall ready victims to disease organisms.

*Treatment.*—Light degree of infestation:—Paint perches and perch supports with a mixture of kerosene and waste oil.

Heavy infestation:—Remove from the fowlhouse all loose earth, boxes, perches, &c., and spray thoroughly with a kerosene emulsion, saturating the floor. Treat perches likewise and replace old nest-boxes with new ones. Repeat every week until the pest is eradicated.

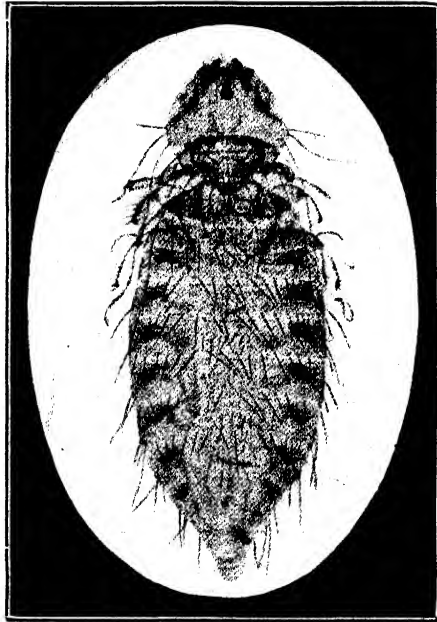


PLATE 159.—COMMON LOUSE OF THE FOWL. (MAGNIFIED 37 TIMES.)

*From Victorian "Journal of Agriculture."*

#### BODY LICE.

There are many varieties of body lice to which poultry of all kinds are subject. All species of birds have their particular species of lice. Those found on the duck will not be found on the fowl. On the fowl may be found lice of several varieties. Some varieties will be noticed crawling about the skin of the body, while others will be adhering to the feathers.

Lice live on either the outer layers of the skin or the feathers, and this fact accounts to some extent for the position in which lice are noticed.

*Effect.*—A few lice, with one exception, on a bird appear to cause very little inconvenience. The exception is a louse about one-tenth of an inch long, dark in colour, which lives on the neck and head. Even this louse causes little ill-effect on adult stock, but with chickens and young growing stock it is responsible for heavy mortality.

When lice of any variety, however, are numerous, they cause considerable irritation, with the result that young stock do not thrive and adult stock cease to be profitable.

Male birds are usually infested to a greater extent than females, and become very thin and weak from the effects of lice. This is due to the fact that they do not dust bath as freely as females. Males should be periodically examined and, if infested, receive special attention.

*Treatment.*—For head louse, which causes such heavy mortality among chickens, it is necessary to catch every bird and lightly smear the feathers around the head and under the beak with olive oil.

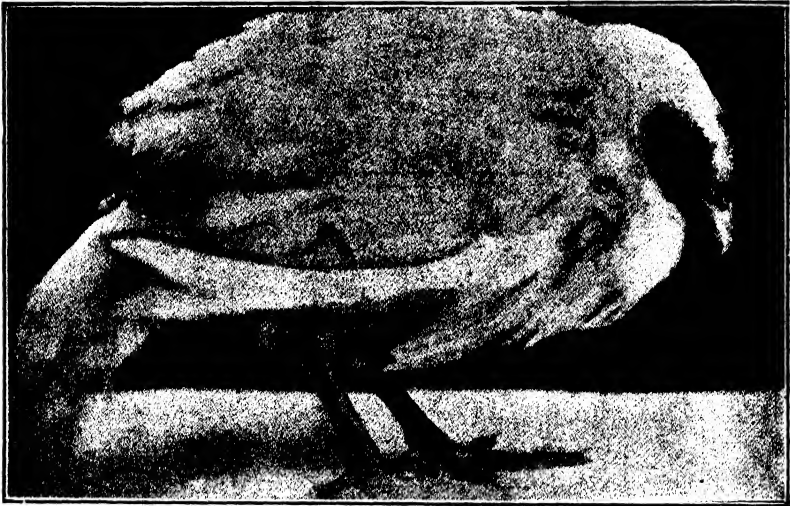


PLATE 160.

This seven-weeks-old Single Comb White Leghorn cockerel is suffering from an attack by head lice. Note the unkempt plumage, dark, dried comb, eyes closed and general dejected appearance.

*Dust Bath.*—Dust baths can be composed of fine road dust and wood ashes. To the dust bath may be added in small quantities flowers of sulphur, tobacco dust, or slaked lime, to make it more effective, but it will be found that by keeping the dust bath slightly moist, particularly in warm weather, the birds will use it more freely and there will rarely be any necessity for making these additions.

Males infested with body lice should be dusted with some good insect powder at fairly frequent intervals, and all feathers around the vent to which lice eggs are attached should be removed. For the flock in general it will be found that a good dust bath will keep lice down to numbers that will not cause discomfort of the stock.

## Lesson IV.

### INTERNAL PARASITES.

The principal internal parasites of poultry may be referred to as round worms and tape worms. There are many varieties of each kind. Other lower forms of life are parasitical upon birds, but they will be dealt with in "Diseases."

#### ROUND WORM.

Round worms may be found varying in size from  $\frac{3}{8}$  in. in length and as fine as a piece of cotton to 3 in. in length and as thick as a wax match. This class of worm, as the name indicates, is round. Varieties of this worm may be found in the crop, stomach, gizzard, intestines, and blind gut.

The round worm is commonly found in the intestine and blind gut. The largest worm will be found in the former, while small worms  $\frac{3}{8}$  in. to  $\frac{1}{4}$  in. in length are found in the latter. Gizzard, crop, and stomach worms are not common.

#### TAPE WORM.

Tape worms vary in size to a greater degree than round worms. Some are so small that it requires a hand lens to detect them, while others may grow to the length of a foot or more.

Tape worms confine their attention to the intestines. The small ones embed themselves in the walls of the intestines, forming small lumps or nodules, and the large hang on by the head, the tail portion floating among the intestine content. The tape worm, as the name suggests, is flat. It is made up of numerous small segments of a chain-like formation, and as the rear portion matures it detaches itself from the chain.

*Symptoms of Worm Infestation.*--Stock infested with worms become dull, weak, and emaciated. They are sunken in face, and lose colour from both the face and legs. The plumage loses its lustre and has a ruffled appearance. With a medium degree of infestation, stock are ravenous feeders, but as the worms increase in numbers their appetites diminish. They become very stilted in their movements and frequently have diarrhoea.

When several birds in any one flock present the foregoing appearance, worms should be suspected, particularly so if the flock has been well cared for. A more definite opinion can be gained, however, by making an examination of the internal organs of one or more of the weedy looking birds.

#### LIFE HISTORY OF WORMS.

In order to intelligently cope with worms, it is necessary to have some idea of how birds become infested. The life-cycle of many worms which trouble poultry has not been studied, but sufficient is known of the more common to enable control measures which prove highly satisfactory, to be adopted.



PLATE 161.—PORTION OF INTESTINES OF FOWL INFESTED WITH WORMS.

This interesting photo of worm infestation was obtained by the writer from a white leghorn pullet. The owner had requested the Department of Agriculture to advise on the treatment of his flock for roup. There was no doubt that the low condition of the birds was largely responsible for their susceptibility to the disease, and all those that were opened for examination showed severe worm infestation. Outbreaks of disease among such stock must be expected.

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There is a distinct difference between the life-cycles of round worms and tape worms, but methods for control are not dissimilar, sanitation playing a most important part in both. The life-history briefly is as follows:—

*Round Worms.*—The worm in the intestine lays its egg, which is voided with the excreta. The egg lies on the soil for some time and undergoes partial development. Moisture is necessary. The bird consumes the partially developed egg adhering to particles of food. The partially developed egg, on entering the digestive tract, hatches. It then commences to feed according to its habit, matures, and lays eggs.

*Tape Worms.*—The ripe segment of the tape worm is voided with the excreta. This segment contains matured eggs. Flies, slugs, and worms feast on the droppings, taking the eggs into their digestive tract. The egg here hatches, the young penetrating the walls of the intestine, encysting itself in the abdominal cavity. The fly, slug, or worm is then consumed by the bird, with the result that an adult tape worm develops from the encysted stage.

*Prevent Infestation.*—The round worm is spread from bird to bird by worm eggs. Therefore the following practice should be adopted:—

Never introduce infested stock on to clean premises.

Avoid rearing chickens on land where adult stock have been running.

Have chicken-rearing pens in a position not easily fouled with the washings from adult pens.

Regularly clean poultry houses and pens to reduce the numbers of worm eggs about the premises.

Keep poultry houses and pens as dry as possible.

It is seen that tape worms require an intermediary host, and that they feed on the excrement containing segments of the worms. The regular cleansing of poultry houses and yards will reduce to a great extent the possibility of the tape worm coming in contact with intermediary hosts.

Moist places, such as under boards, bags, feed hoppers, are favourable places for slugs and worms to find cover. Therefore do not have yards littered with such.

*Treatment.*—No medicament is 100 per cent. efficient, and all treatment needs to go hand in hand with prevention. Otherwise birds are freed from a few worms only to be reinfested.

*Round Worm.*—Any of the following will prove fairly effective, but individual treatment is recommended:—

1. Mix 1 lb. tobacco dust with every 50 lb. of mash.

2. One or two teaspoonfuls according to age, of equal quantities of medicated turpentine and cotton seed or linseed oil.

This is best administered with the aid of a syringe and a piece of rubber tubing. Draw the dose into the syringe. Place the tube down the bird's neck until the lower end enters the crop, then eject the mixture. This care is necessary, for if the mixture entered the windpipe it would cause asphyxia.

3. For small flocks, capsules containing effective worm medicaments could be obtained.

*Tape Worm*.—1. One heaped teaspoonful of powdered pomegranate bark added to the mash for fifty birds.

2. Ten grains areca nut given in mash for each bird.

3. Kamala at the rate of 15 grains in mash.

The above is the dose for adult stock. Half-grown birds should receive half the quantities.

Before administering any worm remedies, the birds should be fasted for twenty-four hours. This is best done by not feeding an evening meal and treating stock the following morning. Follow all treatment in the course of two hours with a dose of salts, at the rate of 1 oz. to the gallon of drinking water.



PLATE 162.—TAPE WORM.

a.—Worm;

b.—An inverted piece of chicken's intestine with numerous tape worms attached.

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## Lesson V.

### COMMON DISEASES.

The diseases that frequently occur among young growing stock are chicken-pox, canker, roup, leg weakness, and scaly leg.

The three former troubles are of a highly contagious nature, and the methods that should be adopted for the prevention and control of all are similar. In considering how to control and prevent disease, the two following points have to be borne in mind:—

1. Stock in good sound physical condition are not so susceptible to diseases as those that are weak and weedy.
2. Disease organisms do not multiply rapidly when poultry houses are kept in good sanitary condition.

#### DISEASE PREVENTION.

To maintain stock in good physical condition, the following conditions must apply:—

1. The stock must be the offspring of sound parents.
2. They must not be overcrowded at any stage of their life.
3. An ample supply of suitable foods must be given.
4. Every precaution must be taken to prevent their being preyed upon by both internal and external parasites.

To maintain the premises in good sanitary condition the following points have to be considered:—

1. Site on which buildings are to be erected.
2. Roofing of fowl sheds.
3. The drainage around fowlhouses and runs.
4. The regular cleaning of the houses and runs.

#### DISEASE CONTROL.

The first point of control is to isolate any sick bird and to remove any bird to other quarters which shows the slightest signs of trouble. Pens and runs should be thoroughly cleaned, despite the fact that they may have received recent attention.

After the cleaning, the sleeping quarters should be thoroughly sprayed with some good disinfectant. The water vessels are a medium by which disease is very easily transmitted, and they should be cleansed and disinfected daily.

If the custom has been to feed dry mash, wet mash should be substituted. Feeding troughs should be emptied, say, half-an-hour after the mash has been distributed. The troughs should then be disinfected.

In the event of an outbreak of disease, the above methods should prevent its rapid spread among the flocks and, in time, eradicate it, but it is necessary to be able to detect disease and treat sick stock.

## CHICKEN-POX.

This disease affects all classes of poultry, but is more pronounced among young stock, particularly those hatched late. It is prevalent during the period from November to April. Once stock have been affected, they appear to be immune to further attacks.



PLATE 163.—CHICKEN-POX ON COCKEREL.

*Symptoms.*—Wart-like growths are noticed on the bare parts of the head and comb. In early stages these warts are little more than small yellow eruptions. When the disease is severe, there is an elevation of temperature, diminished appetite, and general dullness.

*Treatment.*—Isolation of sick birds and painting of wart-like growths daily with one of the following:—

1. Carbolised glycerine—1 part carbolic acid and 15 parts glycerine.
2. 5 to 10 per cent. solution of iodine.
3. 10 grains silver nitrate to 1 ounce of water.

## CANKER.

All classes of poultry are subject to a cheesy-like growth in the mouth. This is termed "Canker," and it frequently associates itself with chicken-pox and roup.

*Symptoms.*—The symptoms are not very pronounced, as affected birds frequently appear to be perfectly healthy. It may be noticed at times that a bird has difficulty in closing its mouth or in swallowing. Examination may show a cheesy-like growth on the upper or lower portion of the side of the mouth or sometimes on the windpipe.

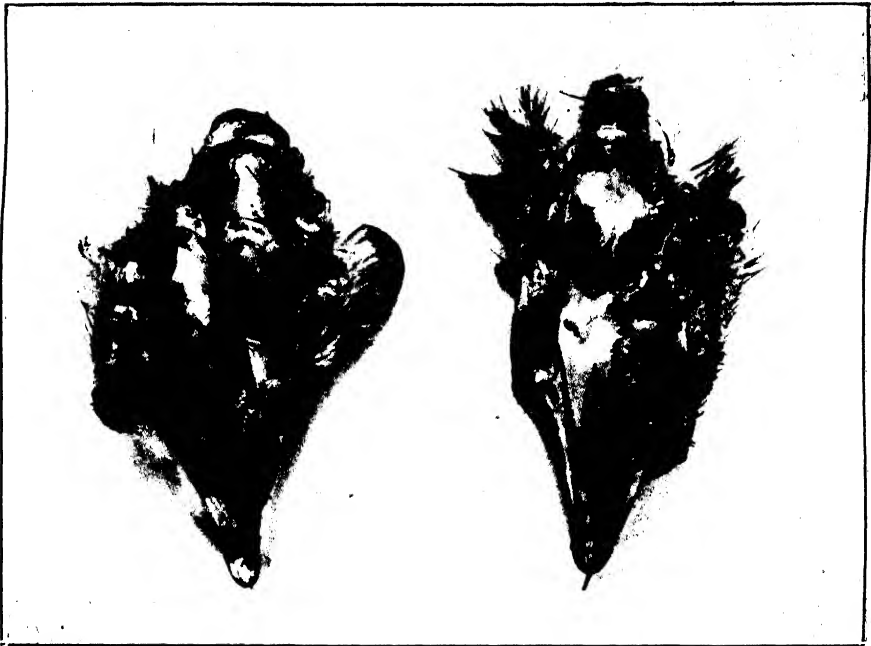


PLATE 164.

The lower jaw of two birds, showing canker growths. Note how tongue is displaced by pressure from growths.

*Treatment.*—Isolate affected bird. Remove as much growth as possible with a small piece of smooth wood. Paint surface with 10 per cent. solution argyrol, 10 per cent. solution iodine, or dust with small quantity of powdered bluestone.

If the disease persists, despite daily treatment, destroy the bird.

## ROUP.

The term "Roup" is applied in a general sense to a discharge of a catarrhal nature of the nostril (contagious nasal catarrh), inflammatory condition of the eyes (eye roup), discharge from the nose and lesions in throat and mouth (diphtheritic roup).

## CONTAGIOUS NASAL CATARRH.

*Symptoms.*—Discharge from nostril of very offensive odour, causing litter and dirt to adhere to beak. Breathing from the mouth on account of stoppage of nostril. Continued sneezing to free nostril. Sick birds stand apart from flock with ruffled feathers and drooping wings. Loss of appetite.



PLATE 165.—ADVANCE STAGE OF CONTAGIOUS CATARRH.  
Nostrils blocked. Collection of mucus forcing mouth open.

*Treatment.*—Destroy birds badly affected. Isolate any to be treated. Submerge head twice daily for about half-a-minute in one of the following solutions to thoroughly cleanse nostrils:—

1. Equal quantities of hydrogen peroxide and water.
2. A 2 per cent. solution of permanganate of potash.
3. Ten grains of silver nitrate to the ounce of water.

In addition, administer one teaspoonful twice daily of olive or cotton-seed oil to which has been added three drops of kerosene and three drops of eucalyptus.

## EYE ROUP.

*Symptoms.*—Eyelids become stuck together with the discharge. This causes a pronounced swelling, and, on the eyelids being prised apart, a cheesy-like substance can be seen. It may affect one or both eyes, one eye usually.

The inflammatory condition causes intense irritation, and the bird is constantly wiping its eye on the wing, with the result that the feathers are soiled.

*Treatment.*—Isolate affected birds. Force apart the eyelids and remove collection of solid matter. Submerge head, as recommended for nasal catarrh. Place in eye twice daily one or two drops of a 10 per cent. solution of argyrol.



PLATE 166.—EYE ROUP IN EARLY STAGES.

The dirty patch on the wing is a warning of eye trouble.

#### DIPHTHERITIC ROUP.

*Symptoms.*—Discharge from nostril of a very offensive odour. Rise in temperature and thirst, and sometimes diarrhoea. Patches of greyish or yellowish growth tissue appear in mouth and throat. Loss of appetite and disinclination to move about.

*Treatment.*—Destroy severely-affected birds and isolate those to be treated. Cleanse head as recommended for catarrh. Remove as much of the growths in mouth and throat as possible without causing bleeding.

Paint the raw area with any of the following:—

1. 10 per cent. argyrol.
2. 10 per cent. iodine.
3. 10 grains of silver nitrate to the ounce of water.

Renew drinking water three times daily, and add sufficient permanganate of potash to make it a good pink colour.

#### LEG WEAKNESS.

*Symptoms.*—The bird may suddenly lose the use of one or both legs or, in the early stages, there may be a slight stiltiness of walk noticed.

*Cause.*—Due to diet deficiency, intestinal worms, disease, or damp quarters.

*Treatment.*—Leg weakness does not respond too readily to treatment. Ascertain the cause and try and remove it. Paint affected leg with 10 per cent. iodine.



PLATE 167.—ADVANCED STAGE OF SCALEY LEG.

#### SCALEY LEG.

*Symptoms.*—Roughened appearance of the leg on account of the elevation of the scales due to a collection of a whitish crust.

*Cause.*—A small mite which lives on the skin under the scales.

*Treatment.*—Paint legs and feet with one of the following:—

1. One part kerosene and one part oil or fat.
2. Carbolised glycerine.
3. Equal parts sulphur and lard.

## FODDER CONSERVATION. .

### AN ANALYSIS OF REQUIREMENTS.

The importance of "stock insurance" by means of fodder conservation was emphasised in these notes recently when the financial advantages of the security so afforded were pointed out. Discussing the requirements of such a scheme, the departmental writer from whose report these paragraphs are taken sets out a dual objective, namely—

1. Provision of adequate fodder supplies for the requirements of the farm.
2. The conserving of a marketable surplus.

The main considerations in the firstmentioned are—

- (a) Ample reserve to cover requirements;
- (b) The provision of a well-balanced ration;
- (c) Provision of a suitable and effective protection against fire, flood, and damage from mice, stock, &c.;
- (d) Location of reserves with a view to ease and cheapness of feeding;
- (e) Cost of conservation.

A safe guide in assessing the quantity of fodder required for one's own use may be based on the following ration for one sheep per day:—

- 1 lb. cereal or lucerne hay;
- 4 oz. grain (crushed oats for preference);
- 2 lb. silage.

Roughly, 122 tons of hay, 31 tons of grain, and 244 tons of silage are required for feeding a flock of 1,000 sheep for a period of nine months. It is a wise precaution, however, to carry reserves capable of tiding one over twelve months.

The provision of a well-balanced ration is essential. Stock continually eating one particular class of fodder generally evince a dislike for it after prolonged feeding, and fail to maintain the same condition as in the early stages of feeding.

### Protection of Stored Fodder.

Adequate protection of the fodder stored is essential, both from a directly economic point of view and in relation to the accurate assessment of one's stocking capacity—it is hard to estimate one's loss when on opening up drought reserves one finds a large percentage unfit for consumption. In the case of stored hay, dunnage should be placed under all stacks to obviate damage from absorption of moisture from the soil. If possible hay straddles of an approved design should be erected, more especially where oaten hay is concerned and intended to be stored for a number of years. This particular class of fodder is most liable to damage from mouse infestation. Well sloping roofs, suitably thatched, are very desirable, and amply repay the additional cost involved.

When thatching, the use of the tie wire in place of binder twine will be found to give more satisfactory results. Weather soon rots the twine, necessitating repair usually in the second year. Again, in stack construction, the higher the walls can be carried the greater the compaction and the less likelihood of damage from mice. The cost of sound stock-proof fences round stacks is fully justified by the protection afforded. Where possible, hay stacks should possess at least a small measure of cover by insurance. In addition, fire breaks should be made a suitable distance from one another so that in the event of fire only an isolated stack is destroyed.

### Protection of Silage.

In many cases due attention is not paid to the protection of silage. In the first place it is highly desirable to allow the pit to settle during filling operations, which latter should never be too hasty. After allowing time for settling, the silage should be built above ground level to a height equal to the depth of the pit. This prevents the covering sinking below ground level and forming a miniature dam for the accumulation of water, and subsequent percolation and damage. The covering should be of ample depth (2 ft. 6 in. at least). The use of horses driven backward and forward while topping the pit will do much to consolidate the earth and leave an impervious top. The covering should be nicely moulded up with a good slope and suitable drains placed down each side of the pit at the surface to carry off all water.

In the selection of sites for silo pits, due consideration must be given to surface drainage and to the possibility of strata resulting in seepage into the pits.

### Iron Bins for Grain.

Grain is most satisfactorily stored in galvanised-iron silos. This method of conservation is fast gaining popularity, and is certainly superior to storage in sheds. The advantages of such bins lie in the facts that they are mouse and weather proof, and their construction permits of fumigation of the grain if necessary. They also have the big advantage that at the termination of feeding the remainder of the fodder is safely conserved without further expense in protection, as is the case with hay stacks and silo pits when they have been opened and their contents not fully consumed.

Where possible, reserves should be in close proximity to water and feeding paddocks, expense in feeding being thereby minimised.

Attention should be given to the baling of hay for drought reserves. Greater protection is afforded from mice by storage in sheds, less space is occupied, and when feeding out it is more economical to handle, and the ration fed is more easily computed. Moreover, it is in a handy form to market immediately if desired.

In studying the costs of fodder conservation, the aim should be to obtain the greatest measure of protection with the minimum of expense. Where large areas of lucerne are cut, the adoption of modern machinery for handling it should receive consideration.

The marketable surplus referred to earlier is best confined to cereal or lucerne hay and oat grain.—“A. and P. Notes,” N.S.W. Dept. Ag.

## MALNUTRITION.\*

By J. C. BRÜNNICH, Agricultural Chemist.

A GREAT majority of our pastoralists had during the last few years a very serious setback on account of drought conditions, and therefore it became necessary to give some advice as to how such conditions may be mitigated, by drawing attention to mistakes made by many and beneficial results obtained by others through the use of licks, &c., during the past season.

The great aim of all animal husbandry is increased production, and this again depends almost entirely on the feeding of stock. Any errors in the feeding will cause malnutrition and disease.

### Food Constituents.

Every one is familiar with the chief constituents of foods, which are—

- (1) Proteins, nitrogenous compounds, the important flesh-forming nutrients;
- (2) Carbohydrates (as sugar, starch, &c.) and fats, all nitrogen-free compounds which build up fatty matter and produce heat and energy;
- (3) Mineral matters, which enter into the formation of bones, teeth, blood, and other fluids of the body; and finally
- (4) “Vitamines,” accessory foodstuffs of which very minute quantities are required for a complete maintenance of health and normal development of the animals, and generally well supplied in green pasture.

The requirement of mineral matter or salts received but very scanty attention until recent times.

The fact that all foodstuffs contain certain amounts of mineral matter, left in the form of ash, when fodders are burned, was well known, and it was generally accepted that any animal fed in a natural way on common ordinary rations like grass, hay, and grain, would receive a sufficient amount of the mineral constituents with the food, which supplied the necessary amounts of proteins, fat, and carbohydrates for its maintenance and growth.

In all living matter the following inorganic constituents are found:—The non-metallic elements—Phosphorus, sulphur, silicon, chlorine, iodine, and fluorine. The metallic elements—Potassium, sodium, calcium, magnesium, iron, manganese, and aluminium; and probably traces of several other elements.

\*A summary of lectures delivered to the pastoralists in different centres along the Great Northern and Central Railway Lines.

It is a false idea to think that the minerals are required for bone formation only. The inorganic constituents are as essential to animal life as the ordinary organic food constituents, proteins, fat, and carbohydrates. The most important function of the food minerals are performed in the soft tissue and in the blood, where they are essential constituents of living matter, and therefore they stimulate and control directly or indirectly all vital processes.

### Functions of Mineral Constituents.

The chief functions of the mineral constituents performed in the animal body are the following:—

1. They are necessary for the maintenance of a proper physiological balance between the mineral elements in the body fluids. Any excess or deficiency of any one of the mineral constituents will affect the vital processes. A deficiency of potassium in the blood will act on the heart muscle and prevent it from relaxing properly, while an excess makes it relax so much that it stops beating. Common salt is an absolute necessity for nutrition, but given in excess will act as a poison and cause serious troubles. The mineral constituents maintain the practically neutral reaction of the blood.

2. They are necessary for the process of digestion. The digestive processes are affected by acidity and alkalinity of the digesting fluids. In the stomach an acid reaction must exist to aid in the pepsin digestion, whereas in the small intestine an alkaline reaction is necessary to allow the trypsin to act. The absorption of the digested products again is controlled by the concentration of the salts, and this concentration will also affect the passage of digested and undigested material along the intestines.

3. Mineral constituents are required as constructive material for the formation of new tissue and building up of the bone skeleton.

4. Milking animals require larger supplies of mineral matters to keep up the yield and average composition of the milk secreted.

### Considerations of Modern Research.

Modern research dealing with the mineral nutrition of farm animals has to consider—

1. Mineral requirement of the various species of farm animals.
2. The correct balance or proportion between the different constituents.
3. Relationship between the inorganic and organic portions of the ration.
4. Effect of outside factors, like sunlight and exercise on the mineral metabolism.
5. Study of diseases caused by faulty mineral nutrition.
6. Mineral constituents of various food stuffs.

1. Of the mineral elements required in the largest amounts for growth, &c., calcium or lime and phosphorus or phosphoric acid stand out on their own, and this is very clearly indicated by the large amounts of both found in the milk of the lactating animals. It will be noticed that the faster the growth of the young animal, the greater the amount of mineral matter required and supplied by its mother's milk.

Species.	Time Required to Double Weight.	Composition of Milk.					
		Protein.	Fat.	Sugar.	CaO.	P <sub>2</sub> O <sub>5</sub> .	Ash.
	Days.	Per cent.	Per cent.	Per cent.	Per cent.	Per cent.	Per cent.
Woman ..	180	1.6	3.3	6.2	0.049	0.056	0.25
Horse ..	60	1.8	1.2	6.9	0.120	0.130	0.30
Cow ..	47	3.5	3.8	4.8	0.161	0.189	0.75
Sheep ..	15	6.7	8.6	4.3	0.250	0.290	0.97
Pig ..	10	7.2	4.6	3.1	0.395	0.357	1.05
Rabbit ..	6	15.5	10.5	2.0	0.89	0.99	2.56

For every 100 lb. of live weight a sheep or a pig requires about 1 lb. of lime and nearly 1 lb. of phosphoric acid, a calf requires about double these amounts and rather more phosphoric acid than lime. As a rule only about one-half of the

lime and phosphoric acid supplied in the food can be assimilated and retained, and therefore the actual amount of food consumed should contain at least double the quantities absolutely necessary.

2. The balance or proportion between the different mineral constituents is now recognised to be of importance, and any serious alteration in the balance between two or more elements may affect assimilation, not only of these elements, but also of other constituents of the ration.

3. The relationship between inorganic and organic constituents of rations is shown by the fact that a ration which contains ample amounts of protein fat and carbohydrates may fail to produce normal growth if it is deficient in one or more of the mineral constituents. Addition of such will at once give increased growth and a much better utilisation of the food stuff.

4. Experiments have shown that sunlight and even artificial irradiation, lead to an improved lime and phosphorus assimilation, and may even make up for the want of vitamine D.

5. Diseases due to deficiencies of mineral matters have been reported from all parts of the world, and a concentrated attack to deal with such diseases is being made the last few years throughout the Empire.

### Investigations on Phosphorus Deficiency.

Sir Arnold Theiler, with a large staff of workers, made a very complete investigation on phosphorus deficiency as the cause of several diseases in South Africa, which were completely checked by giving the cattle liberal doses of bonemeal.

A full copy of his report appeared three years ago in the "Queensland Agricultural Journal" for March, 1925. Unfortunately, not much notice of the importance of his discovery was taken by readers at the time, and only his personal visit to the Commonwealth gave a fresh stimulus to this matter, more particularly as both he and Dr. J. B. Orr, Director of the Rowett Research Institute, Aberdeen, another overseas visitor to our States, clearly recognised similar wants in our pasture as well as clear signs of malnutrition. The principal sickness due to phosphorus deficiency in South Africa, is the *Styfsiekte* or stiffness, with its most obvious outward sign of bone chewing, or osteophagia. This is a specific form of depraved appetite, showing by cattle having a predilection for bones, chiefly bleached bones. In more aggravated cases even putrifying bones and rotten carcasses are eaten. The animals are easily tested in practice if they are marked cravers, slight cravers, or non-cravers, which is very useful for experimental purposes. The osteophagia is a precursor of serious diseases, stunted growth, poor condition, and heavy mortality. Feeding the animals with 3 oz. of bonemeal per head per day absolutely controls the disease, and enormously improves the condition of the cattle.

A few diagrams shown in Sir Arnold Theiler's report, which is republished in full in the September number of the Journal, clearly demonstrate the improvement in growth, increase of food consumed, &c. Particularly interesting is the quick change which takes place when batches of the experimental animals have their treatment reversed, the controls receiving bonemeal, and the bonemeal withdrawn from others. The change in the animals manifests itself in a very short time, and the recovery of some is simply marvellous.

Seasonal changes should also be noted, and the quick improvement in cattle following spring rains.

The phosphorus was supplied in various forms, but the results obtained were the same. Addition of lime did not prevent osteophagia, but rather increased the evil. Bonemeal as the best and cheapest form of phosphatic available in South Africa was chosen for general use. Mineral phosphates were tried, but were found too costly and rather difficult of digestion; superphosphate was found to cause digestive troubles. Precipitated calcium phosphate behaved very much like bone phosphate. In finely ground Nauru and Ocean Island phosphate we have a natural pure tricalcic phosphate which can be safely used in place of bonemeal.

Application of phosphatic fertilisers to pasture, in South Africa using 500 lb. superphosphate per acre, produced the same results as bonemeal feeding, but, of course, this is of not much practical value to our pastoralists, as phosphatic manuring on a large scale would not be an economical proposition.

The want of phosphorus was traced by Sir Arnold Theiler and his co-workers to the pastures and to the soil itself, and in all the affected areas, the soil showed a great lack in available phosphoric acid, being generally less than .001 per cent.

There can be no doubt that our stock suffer to some extent, more so in certain districts, from a phosphorus deficiency, which becomes more evident and pronounced in drought periods. A supply of phosphorus just or barely sufficient for maintenance is quite inadequate for reproduction and growth. Sir Arnold Theiler's results showed that a breeding cow requires in the earliest stage of pregnancy only about 2 oz. of bonemeal per head per week more than an ox, whereas in an advanced stage of pregnancy as much as 28 oz. bonemeal per week were required to prevent osteophagia.

### Comparison of Composition of Pasture Grasses.

Of particular interest is the study of the following table giving the composition of pasture grasses as found in South Africa, in Queensland, &c., as compared with good European pasture.

	Analysis of Water Free Material.				
	Protein.	Fibre.	Ash.	CaO.	P <sub>2</sub> O <sub>5</sub> .
	%	%	%	%	%
Fattening Pasture, Romney Marsh, eaten ..	22.9	20.2	8.7	0.99	1.01
Fattening Pasture, Romney Marsh, non-eaten ..	13.5	28.2	5.6	0.75	0.65
Non-fattening, Romney Marsh, eaten ..	21.1	20.2	7.6	0.90	0.89
Non-fattening, Romney Marsh, non-eaten ..	12.3	29.2	5.6	0.73	0.58
Poor Average Pasture, England, eaten ..	15.9	25.2	5.5	0.56	0.60
Poor Average Pasture, England, non-eaten ..	11.4	29.3	3.1	0.30	0.37
Pasture, Falkland Island, eaten ..	12.2	..	4.6	0.29	0.54
Pasture, Falkland Island, non-eaten ..	7.0	..	2.5	0.14	0.25
Mixed Pasture, South Africa, November ..	19.4	22.5	11.6	0.31	0.60
Mixed Pasture, South Africa, January ..	13.8	25.0	7.7	0.50	0.22
Mixed Pasture, South Africa, March ..	7.2	33.7	5.9	0.43	0.24
Mixed Pasture, South Africa, May ..	4.1	34.9	5.9	0.50	0.07
Mitchell Grass, Queensland, green, 1926-27 ..	7.9	31.7	10.9	0.62	0.38
Mitchell Grass, Queensland, yellow, 1926-27 ..	6.0	28.9	10.7	0.44	0.20
Mitchell Grass, Queensland, roughage, 1926-27 ..	2.8	32.9	10.0	0.38	0.12
Mitchell Grass, Queensland, midgrowth, 1913-14 ..	5.5	41.0	12.3	0.57	0.37
Queensland Average Mixed Pastures (15 samples)	6.3	41.2	11.9	0.49	0.45
Paspalum Pasture, Unfertilised, 9 days old ..	8.2	25.4	12.7	0.72	0.55
Paspalum Pasture, Unfertilised, 44 days old ..	6.8	29.8	11.9	1.15	0.37
Paspalum Pasture, Fertilised, 9 days old ..	15.5	24.1	13.3	0.50	0.66
Paspalum Pasture, Fertilised, 44 days old ..	7.4	35.9	10.2	0.63	0.40

The most striking feature is the high percentage of protein, lime, and phosphoric acid, calculated on the water free material, found in the pastures readily eaten by sheep on Romney Marsh, England.. The pasture not eaten is still very much richer than the best of our own pastures. On Falkland Island, which is heavily stocked, a considerable falling off in the stamina of the sheep has been noted and is due to the fact that the pasture was never fertilised. The mineral constituents lime and phosphoric acid are very low. The great falling off in nutritious quality of the South African pastures with age is clearly shown, more particularly the great reduction in the phosphoric acid contents of the ash, which is quite good in November, becomes already low in January and March, and falls away to practically nothing in May.

A similar condition exists in the Mitchell grass pasture and a distinct want of phosphoric acid in the older growth is to be noticed.

The great increase in the protein contents of paspalum pasture due to application of a complete fertiliser, with an extra supply of nitrogenous manure, is also worth noting.

### Lack of Protein.

It has been found that the supply of lick will lead to greater consumption of fodder, and greatly help in the digestion and assimilation of all nutrients, but after all it cannot create protein if it is not there, and the actual value of a

feed must depend principally on the amount of protein it supplies. I have repeatedly expressed the opinion that our stock are suffering for long periods of their existence of a protein starvation, with or without lime and phosphorus deficiencies. Lime itself is but very rarely deficient, but phosphorus is, although not in such a pronounced degree as found by Sir Arnold Theiler in South Africa. Only in very isolated cases our soils contain less than 0.01 per cent. of available phosphoric acid, which means about 300 lb. per acre foot, whereas the soils in South Africa, showing disease, have only .001 per cent. or 30 lb. per acre foot. For years very full analyses of grasses, fodders, &c., have been carried out in our agricultural laboratory, and only in a very few cases such low amounts of phosphoric acid have been found in the samples as are recorded in South Africa.

### **Sheep Affected by Malnutrition.**

Sheep will be affected by malnutrition in a similar manner, although the outward symptoms are rarely so pronounced as with cattle. Bone chewing, and more frequently licking up of earth, are noticed; an excessive liking for salt is also an indication of depraved appetite. The fact of sheep licking certain soil does not indicate that such soil would make a good lick, as many a correspondent to this Department has asserted. The far-reaching results of malnutrition are shown by stunted growths, loss of fecundity, poor percentage of lambing, great mortality among young lambs, greater liability to suffer from worms, and attack by blow flies. Of course all these symptoms become more pronounced during periods of drought. A large number of pastoralists tried to save their sheep from starvation by giving them salt licks, and in many cases where the drinking water was also saline, actually killed the sheep through salt poisoning. The actual amount of salt required by sheep is extremely small, only about 4 to 5 lb. of salt are required per annum, and this quantity is generally fully supplied in the pasture grass, and drinking water. The other mineral constituents, lime and phosphoric acid necessary for the maintenance of an adult sheep, are generally supplied by good natural pasturage, but in the case of ewes the requirements increase rapidly during pregnancy and remains high during the lactating period, so that the amounts supplied by pasturage are in a great number of places not sufficient to cover the demand. The requirements of a young growing lamb are equally high, and from two to three times greater than those of an adult sheep.

The actual amounts of lime and phosphoric acid removed from the soil by wool and sheep are very small, amounting to a few ounces per acre annually; even with fairly heavy stocking of, say, one sheep to  $2\frac{1}{2}$  acres, the amount of lime phosphate removed would be approximately only 1 lb. per acre per annum; so that, with an average amount of one-hundredth of a per cent. of available phosphoric acid in a soil, the supply would last many hundred years. Unfortunately, the situation is not quite as favourable as it appears at first sight. Stock naturally prefer the best and most succulent fodders and remain in such localities, and as a consequence the best and most nutritious grasses are eaten out continually and are likely to disappear and be replaced by coarse, poor varieties. As previously pointed out, amounts of mineral constituents must be available in large excess, both for vegetable and animal growth.

### **Analyses of Soil.**

Mr. J. E. Thomas, when making his investigation on the feeding of sheep under drought condition, drew particular attention to the great difference between the pebbly and rolling downs in Central Queensland with regard to nutritive value and palatability of the grasses. The pebbly downs always show a much higher lambing percentage, better growth and yield of wool. These facts were explained by analyses of the soils made in our laboratory. The physical condition of the pebbly downs soil was much better than that of the clayey downs, showing much better capillarity. Humus and nitrogen contents of both soils were rather low, lime plentiful both total and available amounts, the amount of available phosphoric .0195 per cent. in pebbly downs soil against .0014 per cent. in clayey down soil, which is dangerously low. The actual amount of feed grown in good seasons is much larger on the rolling downs soil, but the fodder is not so well relished as the sparser growth, but more varied and palatable feed of the pebbly downs.

The principal fodder grass in the western country is Mitchell grass, which is the most drought resistant of our grasses, but its nutritive value is generally very much overrated. The quality varies very much according to seasons, as shown by a great number of analyses, but is at its best in its young growth.

Flinders grass requires a better rainfall than Mitchell grass, but is a more nutritious and more palatable grass, even in the drying-off stage.

## *A Valuable Preparation for Graziers—*

*Mr. Phillip A. Wright, of "Wallamumbi," Armidale, N.S.W.,  
and "Keandon," Inglewood, Queensland, writes under date 24th  
March, 1928—*

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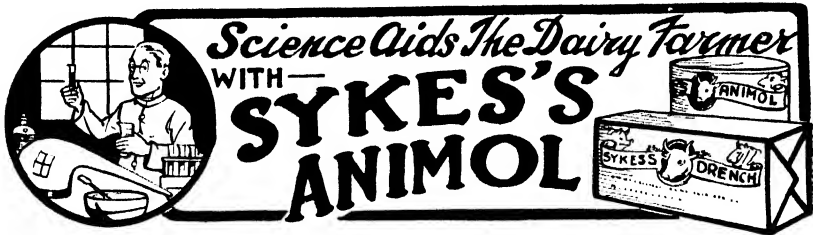
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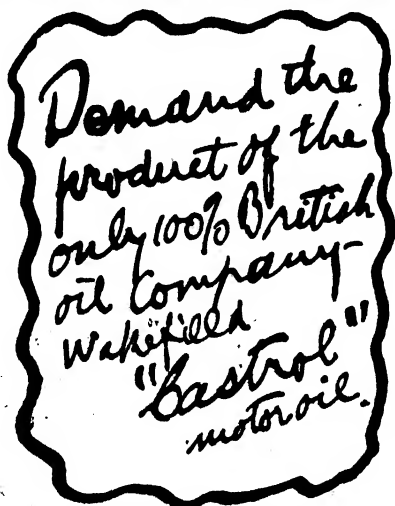
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Blue grasses require a still heavier and more evenly distributed rainfall and are highly nutritious in their earliest stages of growth, but lose their nutrition value very quickly when drying off.

Edible herbs and shrubs are available in most districts, although restricted in the main areas of Central and Northern-West Queensland.

Looking over a short list of analyses of such fodder plants, it will be noted many of them are of high food value. The prickly acacia bush stands out on its own on account of high protein contents, and is therefore greatly relished by stock.

### Food Supply in Time of Drought.

The greatest problem facing the stockowner is the feeding during drought periods. From the previous remarks it is quite evident that the roughage available in such periods is of exceedingly low feeding value, and therefore the problem resolves itself into supplies of proteins, minerals, and roughage itself.

Proteins can be supplied principally in forms of maize and other grains, and prepared concentrated fodders in the form of nuts or cubes, in which mixtures of all sorts of grains, by-products, and milling offals can be utilised with advantage.

Lucerne hay is of great value, being high in protein and minerals, and at the same time is a palatable roughage, but, unfortunately, high cost limits extensive use. The supply of roughage is the most serious problem in drought time, as it is quite impossible to maintain sheep on licks or grains alone.

What could be done with regard to conservation of fodder for roughage, bush hay, and perhaps in some cases fodder crops, chiefly sorghums, are problems of the future. In the meantime the liberal use of phosphatic licks will improve matters, and stock should be allowed to make the best use of poor coarse fodders, this being advantageous to the grazier in good and bad seasons.

### Licks Recommended.

The lick at present recommended, and already successfully used in several places, is made by mixing one part of coarse salt (free from large lumps) with two parts finely ground Nauru or Ocean Island phosphate.

Nauru phosphate is an excellent substitute for bonemeal, as it is cheaper and contains a much higher percentage of lime and phosphoric acid than bonemeal. It is just as digestible as bonemeal, being soluble in weak acids on repeated extraction. The reports spread by some interested persons that Nauru phosphate has caused digestive troubles and ulcerated intestines is absolutely without foundation. Professors McCollum, Hart, and Fuller proved nearly twenty years ago that pigs could be equally well supplied with the necessary phosphorus in the form of inorganic phosphorus compounds, such as precipitated calcium phosphate, mineral phosphates, &c., as in the form of organic phosphorus compounds such as those found in bran, &c. (Research Bulletin No. 1 of the Agricultural Experiment Station, of the University Wisconsin, June, 1909.)

The use of phosphatic licks is of particular importance when feeding on scrub, as practically all our western scrub trees contain in the ash of their leaves a very large amount of lime and very little phosphoric acid. Any large excess of lime accentuates the want and deficiency of phosphorus.

When feeding very dry, coarse roughage, the addition of small amounts of Epsom sales, about 10 lb. to every 100 lb. of lick, is advisable. In very rare cases the addition of about 3 to 5 per cent. of flowers of sulphur, and/or 2 to 3 per cent. of iron sulphate (green vitriol) may have a beneficial effect.

### Quantity of Licks to be Supplied.

It is of importance that the stockowner has a rough idea how much lick the animals actually consume; a lamb or a wether should get about 2 oz. of phosphate, or 3 oz. of the mixed lick per week; a ewe with lamb can get up to 6 oz. of phosphate per week. As the Nauru phosphate has neither taste nor odour, the animals in some cases do not take readily to the lick, and in such cases sprinkling the lick with a little molasses, or adding about 5 to 10 per cent. of linseed meal, or any other meal to the lick will induce the animals to eat the lick more readily. The addition of these materials is discontinued or reduced when a sufficient amount of lick is consumed. An extra amount of phosphate will not hurt the sheep, but an increased amount of salt may do serious harm. Keep a supply of lick going the whole year round, so that the animals can get it any time they want it.

## RAINFALL IN THE AGRICULTURAL DISTRICTS.

TABLE SHOWING THE AVERAGE RAINFALL FOR THE MONTH OF OCTOBER, 1928, IN THE AGRICULTURAL DISTRICTS, TOGETHER WITH TOTAL RAINFALL DURING 1928 AND 1927, FOR COMPARISON.

Divisions and Stations.	AVERAGE RAINFALL.		TOTAL RAINFALL.		Divisions and Stations.	AVERAGE RAINFALL.		TOTAL RAINFALL.	
	Oct.	No. of Years' Records.	Oct., 1928.	Oct., 1927.		Oct.	No. of Years' Records.	Oct., 1928.	Oct., 1927.
<i>North Coast.</i>					<i>South Coast—continued:</i>				
Atherton ...	In. 0.88	27	In. 0.07	In. 0.59	Nambour ...	In. 2.98	32	In. 0.72	In. 4.37
Cairns ...	1.84	46	0.05	1.72	Nanango ...	2.30	46	1.26	3.38
Cardwell ...	1.95	56	0.13	2.11	Rockhampton ...	1.80	41	1.26	2.19
Cooktown ...	1.03	52	0	0.10	Woodford ...	2.50	41	0.78	2.55
Herberton ...	0.89	41	0.04	0.86					
Ingham ...	1.55	36	0	1.66					
Innisfail ...	2.89	47	0.08	3.35					
Mossman ...	2.83	15	0.31	4.22					
Townsville ...	1.24	57	0.62	0.45					
<i>Central Coast.</i>					<i>Darling Downs.</i>				
Ayr ...	0.97	41	0	0.19	Dalby ...	2.04	58	1.07	2.66
Bowen ...	1.05	57	0.04	0.90	Emu Vale ...	2.18	32	1.60	4.50
Charters Towers ...	0.67	46	0.19	0.35	Jimbour ...	1.88	40	2.25	2.87
Mackay ...	1.78	57	0	1.98	Miles ...	2.00	43	0.27	2.83
Proserpine ...	1.80	25	2.09	3.25	Stanthorpe ...	2.55	55	1.83	2.62
St. Lawrence ...	1.77	57	3.21	3.01	Troowomba ...	2.56	56	1.85	3.16
					Warwick ...	2.28	63	1.55	2.99
<i>South Coast.</i>					<i>Maranoa.</i>				
Biggenden ...	2.29	29	0.49	3.41	Roma ...	1.77	54	0	2.99
Bundaberg ...	2.01	45	0.45	3.01					
Brisbane ...	2.56	77	1.30	7.15					
Caboolture ...	2.50	41	1.44	2.55					
Childers ...	2.46	33	0.27	4.86					
Oroahurst ...	3.33	35	1.53	5.74					
Esk ...	2.47	41	1.79	6.68					
Gayndah ...	2.37	57	0.44	4.19					
Gympie ...	2.69	58	2.25	4.54					
Kilkivan ...	2.79	49	3.14	5.09					
Maryborough ...	2.68	56	0.48	7.05					
					<i>State Farms, &amp;c.</i>				
					Bungewongorai ...	1.47	14	0.25	2.12
					Gatton College ...	2.04	29	1.39	2.84
					Gindie ...	1.40	29	...	2.32
					Hermitage ...	1.90	22	1.26	3.46
					Kairi ...	1.01	14	0.28	0.70
					Sugar Experiment Station, Mackay	1.54	31	0	1.86
					Warren ...	2.02	14	0.47	2.58

NOTE.—The averages have been compiled from official data during the periods indicated; but the totals for October this year, and for the same period of 1927, having been compiled from telegraphic reports, are subject to revision.

GEORGE G. BOND, Divisional Meteorologist.

## QUEENSLAND RAIN-FOREST TREES

By W. D. FRANCIS, Assistant Government Botanist.

Oliver's Sassafras (*Cinnamomum Oliveri*) is illustrated by the accompanying pictures. It is a large tree, attaining a height of about 130 feet. The bark is brown or dark brown in colour and is rough with hard, pustular processes, especially on large trees. The bark is also strongly fragrant, the odour resembling that of sassafras. The wood is pale or yellowish when green; when seasoned it is pale brown. The sassafras-like fragrance persists in the wood even when it is aged. The wood is very suitable for indoor work, such as lining and cabinet-making. The trees are found in the rain forests from Port Macquarie in New South Wales (R. T. Baker) to Eungella Range (west of Mackay), Queensland.



*Photo: W. D. Francis.*

PLATE 168.—OLIVER'S SASSAFRAS (*Cinnamomum Oliveri*).

A large tree in the rain forest to the east of Traveston. The peculiar pustular bark is shown in the picture.

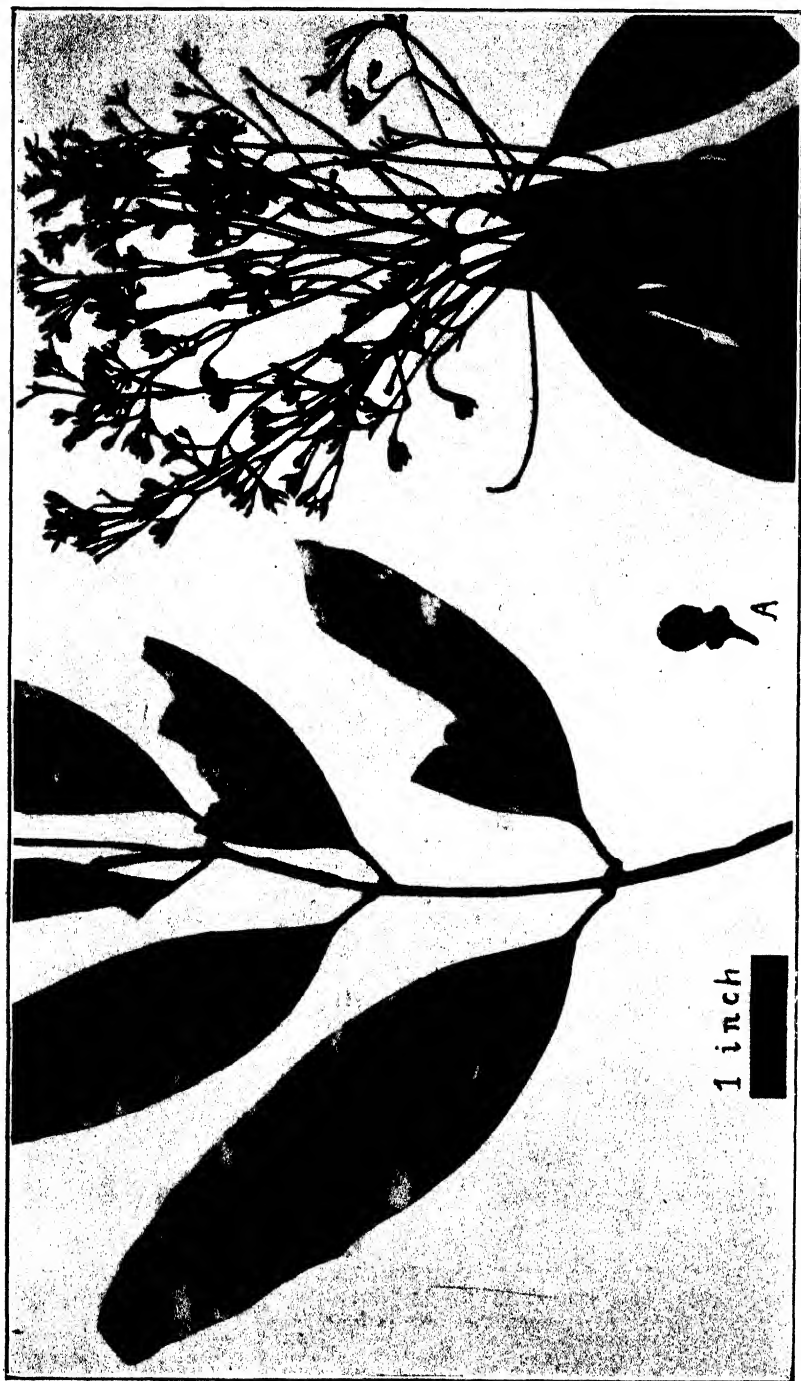


PLATE 169.—HERBARIUM SPECIMENS OF OLIVER'S SASSAFRAS.

A shows a dry fruit partly detached from the cup-shaped perianth tube which surrounds the fruit at base. The minute pustular marks on each side of the midrib of the leaves on the left represent scale insects. A flowering specimen is shown on right.

## INKWEED ERADICATION..

By N. A. R. POLLOCK, Northern Instructor in Agriculture.

### Experiments Conducted.

The greatest trouble that settlers experience in many of the heavy scrub areas of Queensland in grassing land, on which the felled scrub has recently been burnt off, is due to the heavy and persistent growth of Inkweed (*Phytolacca octandra*), which if not destroyed, soon covers the ground and smothers the young grass shortly after the seed has germinated. The most satisfactory and economical method of dealing with the trouble will be found, it is considered, in pulling up the young Inkweed plants as they appear, thus giving the young grass opportunity to become established, after which germination of further Inkweed seed or growth of same after germination will be greatly impeded. By this means a stand of grass is secured the first year, the value of which is apparent.

In certain areas, however, notably in the vicinity of Millaa Millaa, where the rainfall is heavy, the growth of Inkweed, many settlers claim, has been too rapid to allow of extermination by hand pulling or hoeing, causing many areas on which grass seed was sown after the scrub had been felled and burnt off to become so infested that growth of grass was entirely prohibited.

With a view to overcoming this trouble, the Department of Agriculture instituted experiments in control by the application of various poisonous sprays, which were carried out during the present year by Mr. Field Assistant Tarrant, of the Atherton office.

The design of the experiments was as follows:—

1. Roberts' Prickly Pear Poison in strength as supplied.
2. Cooper's Weedicide—1 part to 75 parts water.
3. Cooper's Weedicide—1 part to 50 parts water.
4. Arsenic Pentoxide— $\frac{1}{2}$  lb. to 1 gallon water.
5. Arsenic Pentoxide— $\frac{1}{2}$  lb. to  $1\frac{1}{2}$  gallons water.
6. Arsenical solution—1 lb. arsenic and 2 lb. caustic soda to 25 gallons water.
7. Arsenical solution—2 lb. arsenic and 4 lb. caustic soda to 25 gallons water.
8. 2 lb. ferrous sulphate to 1 gallon water.
9.  $1\frac{1}{2}$  lb. ferrous sulphate to 1 gallon water.

The cost of the materials were—

- Roberts' Prickly Pear Poison, 3  $\frac{1}{16}$  d. per lb., Wallangarra.
- Cooper's Weedicide, 52s. 6d. per 5-gallon drum, Brisbane.
- Arsenic Pentoxide, 37s. 4d. per cwt., Brisbane.
- Arsenic, 40s. per cwt., Brisbane.
- Caustic soda, 40s. per cwt., Brisbane.
- Ferrous sulphate, 16s. per cwt., Brisbane.

Roberts' pear poison was applied by a Roberts' pump and atomiser, while the other solutions were applied by a knapsack spray pump. The experiments were conducted on Inkweed of three years' growth and on young Inkweed of about six months' growth. Each plot was designed as one-tenth of an acre, with a width of 12 feet.

Mr. Tarrant reports:—

### OLD INKWEED TRIALS.

These were conducted in January at E. Grindie's farm, Moregatta, where the Inkweed was of three years' growth and almost impenetrable. Lines were brushed to facilitate operations and to allow application from each side of the 12-foot strip; each plot took from eighty to ninety minutes to treat, excluding the time required for brushing the lines, which implied a period of two days, approximately to treat an acre. Heavy rains occurred each day during the applications, causing a postponement of Cooper's Weedicide and ferrous sulphate treatments until finer weather prevailed.

Plot (1) Roberts' Pear Poison at full strength.—The plants showed a scorched effect within five minutes of the application, all top growth and roots being dead



PLATE 170.—INKWEED EXPERIMENTS.  
P lot treated with Arsenic Solution without effect.



PLATE 171.—YOUNG INKWEED OF UNDER A YEAR'S GROWTH, NOT TREATED.

within three weeks. The poison used was at the rate of 25 gallons, and at a cost of £3 8s. 9d. per acre.

Plot (2) Cooper's Weedicide at 1 part to 75 parts water.—The plants did not show any effect until after three days, when the leaves and small branches were killed; but within three weeks fresh growth was made from the main stems, and several weeks later the plants appeared as vigorous as before the application. The cost of the material was at the rate of 10s. 10d. per acre, with 40 gallons of solution.

Plot (3) Cooper's Weedicide at 1 part to 50 parts water.—The experience here was similar to that in Plot 2, while the cost per acre of the application was 16s. 3d. at the rate of 40 gallons.

Plot (4) Arsenic Pentoxide,  $\frac{1}{2}$  lb. to 1 gallon water.—After four days the effect was noted on the foliage, and in five weeks the plants had died down to the ground, but new growth appeared from the roots. The cost of the application was 6s. 8d. per acre at the rate of 40 gallons.

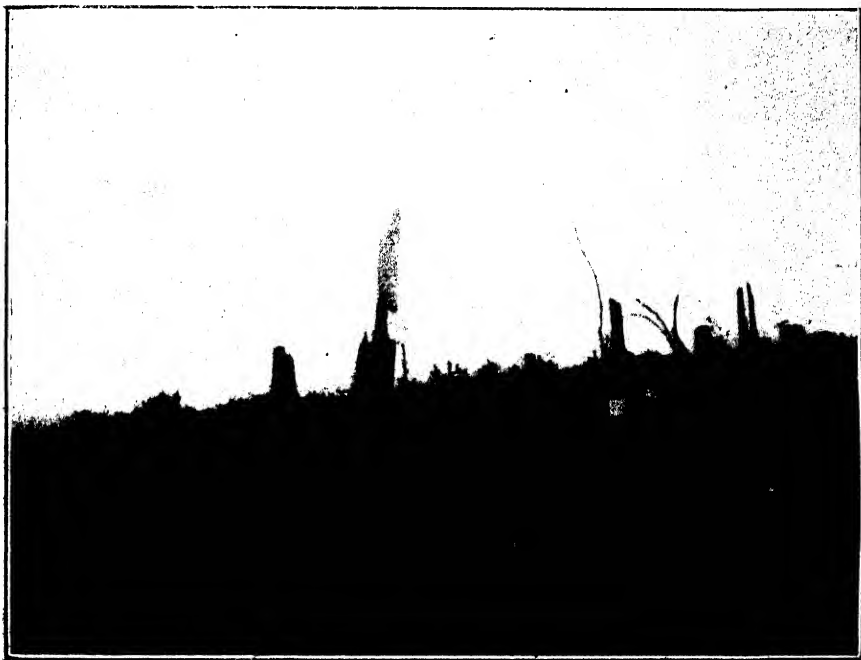


PLATE 172.—SHOWING PLOTS OF INKWEED OF 3 YEARS' GROWTH TREATED IN JANUARY. PHOTO. TAKEN IN JUNE.

Plot in foreground was treated with Roberts' Pear poison which killed the Inkweed. Growth on plot is "Goat Weed." Stump in foreground may be seen in photo. 1 at the top marking end of plot.

Plot (5) Arsenic Pentoxide,  $\frac{1}{2}$  lb. to 1½ gallons water.—The experience here was similar to that on Plot 4, except that the action of the spray was much slower. Cost of treatment was 5s. 6d at the rate of 40 gallons per acre.

Plots (6) and (7) Arsenical solutions, and Plots (8) and (9) Ferrous Sulphate solutions.—These applications showed no appreciable effect on the growth.

#### YOUNG INKWEED TRIALS.

These trials were conducted in May on T. Fraser's farm, Lorenz Creek, where the Inkweed was not of more than six months' growth, and offering no difficulty in applying the treatments. Viewing the effect of the sprays on the older growth in January, an alteration was made in the treatments, in which the results were as follows:—



PLATE 173.—YOUNG INKWEED OF UNDER A YEAR'S GROWTH.

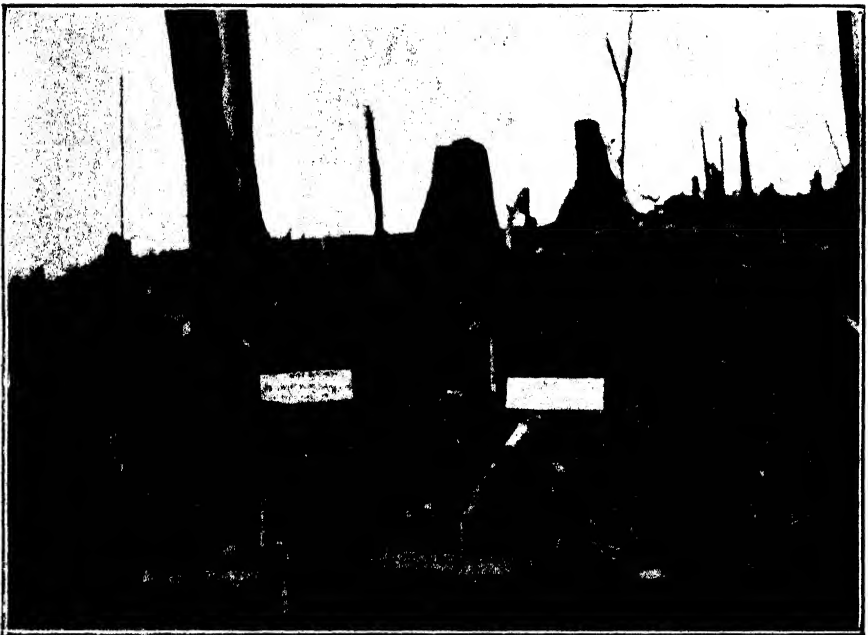


PLATE 174.—INKWEED EXPERIMENTS ON YOUNG INKWEED.

Left.— $\frac{1}{2}$  lb. Arsenic Pentoxide to 1 gallon water.

Right.— $\frac{1}{2}$  lb. Arsenic Pentoxide to  $1\frac{1}{2}$  gallon water.

Plot (1) Roberts' Pear Poison, full strength.—Within five minutes after treatment the foliage was all scorched, and within ten days all growth and roots were dead. The cost per acre at an application of 20 gallons was 55s.

Plot (2) Roberts' Pear Poison, half strength.—This treatment took several hours to show any effect, but in twelve days all growth and roots were killed. The cost of the application at 20 gallons was 27s. 6d. per acre.

Plot (3) Arsenic Pentoxide at  $\frac{1}{2}$  lb. to 1 gallon water.—No effect was shown on the plants until the third day, but in fourteen days all growth and roots were dead. The cost of the application at 30 gallons per acre was 5s.

Plot (4) Arsenic Pentoxide at  $\frac{1}{2}$  lb. to  $1\frac{1}{2}$  gallons water.—The effect here was as successful as in Plot (3), but much slower. The cost of the application at 30 gallons per acre was 3s. 4d.



PLATE 175.—THE EFFECT OF ROBERTS' PRICKLY-PEAR POISON ON YOUNG INKWEED. Full strength to left of board; half strength to right of board.

Dividing line of two plots marked by a line from the board in the foreground and the figure up the hill. Treated in May, photo. taken in June.

Plot (5) Arsenic solution at 2 lb. arsenic and 4 lb. caustic soda to 12 gallons water.—Used at the rate of 30 gallons per acre no effect was noticeable at any time after the application. The time occupied in applying the treatments was at the rate of eight to ten hours per acre.

When the plots were inspected in company with Mr. Tarrant on 10th June it was noted that the plot treated in January with Roberts' Pear Poison, where the old Inkweed had been completely destroyed, showed a heavy growth of Billygoat Weed (*Ageratum conyzoides*). This weed is an annual of late season growth, common to the Tableland, which dies down in the winter and is useful in the maize areas in assisting to burn off the dry cornstalks, an office it may possibly perform to advantage with the dry Inkweed. On old Inkweed, of the applications made, Roberts' Pear Poison, only, appears to be effective, but the cost of £3 8s. 9d. for poison added to that of two days' labour in applying, as well as the brushing of tracks, does not

render it an economical proposition; even if the heavy growth could be killed out at a cheaper rate and burnt off, much the same trouble as on newly felled areas would be faced with the young Inkweed growth when the land was resown with grass seed.

Further trials in heavy Inkweed growth are suggested, in which a gaseous treatment might be more economically effective.

On the young Inkweed growth the cost of the treatment with Arsenic Pentoxide at 5s. 6d. or 6s. 8d. per acre, plus that of labour in applying, is the most reasonable, but it is probably that the treatment would also kill out any grass growth and thus necessitate a reseeding.

Possibly, if the Inkweed were allowed to germinate on the new clearing, and then destroyed by spraying before the grass seed was sown, success might be achieved.

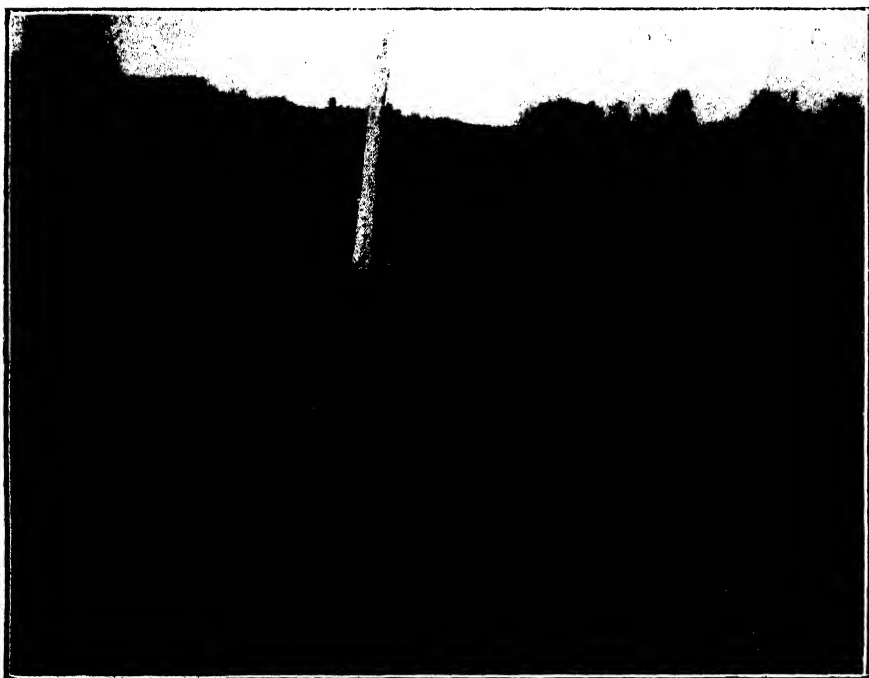


PLATE 176.—ROBERTS' PRICKLY PEAR POISON ON INKWEED OF OVER  
3 YEARS' GROWTH.

Plot was a strip 12 feet wide running from the front to the right of tree in the centre to stump on top of the hill. Applied in January. The photo. was taken in June. Inkweed completely killed, but largely hidden by growth of "Goat Weed" which dies off in spring and allows of burning off with the dead Inkweed.

The objective, of course, is to establish grasses on the clearing at the least cost. In the case of young Inkweed, the cost of eradicating by hand must be set against that of spraying perhaps more than once, and also of perhaps reseeding a second time, with subsequent loss of time in getting grasses established. Until further data is obtained in this direction, it would appear that settlers would be well advised to pursue the old method of sowing the grass seed immediately after the burn and eradicating the young Inkweed plants by hand. Should this not be found practicable over the whole area, alternate strips might be given attention which would allow a certain amount of grass to be secured and thus give greater facility for spraying the other strips where the Inkweed had taken possession.

## GINGER GROWING IN QUEENSLAND.

By A. E. GIBSON, Senior Instructor in Agriculture.

A good deal of attention has lately been drawn to the cultivation of ginger as a crop which is suited to the soils and climate of Queensland, but it must be remembered that the consumption of ginger within the Commonwealth is comparatively small, but by means of an advertising campaign it could possibly be increased by double the quantity that is imported and consumed at the present time. At the same time, care must be taken to prevent over-production of the locally-grown article.

As regards the importations of ginger in all forms, for the period ending 30th June, 1928, a total of 672½ tons of ginger was imported to the Commonwealth from overseas, chiefly from China. This includes green, dry, and partially and wholly preserved ginger which could be produced in Queensland by the cultivation of approximately 200 acres of land—hence the need of caution is reiterated in regard to ginger production.

Unless the local grower is prepared to accept a price which is in accord with that at which the article can be imported, there appears to be very little hope of replacing the imported article by that produced locally.



PLATE 177.—A HEAVY CROP OF GINGER ON THE SLOPES OF BUDERIM MOUNTAIN.

A visit was recently paid to Buderim Mountain to ascertain what progress was being made in the industry, and it would appear that there is at present a "boom" in the ginger-growing industry. An article on ginger growing at Buderim which was published recently may be largely responsible for this. The article in question stated that "although the markets may fluctuate slightly, growers may expect to receive an average price of approximately £56 per ton." This price is, of course, for large quantities, 9d. per lb. being obtainable for small lots. It may interest growers to learn that green ginger is imported into the Commonwealth and landed at Melbourne at a cost of £32 13s. 4d. per ton c.i.f., or 3½d. per lb. Semi-preserved ginger in syrup is landed in Brisbane at £40 per ton c.i.f., and in regard to this class of ginger it may be stated that in a 2-cwt. cask of partly preserved ginger, not more than 20 lb. would be represented by syrup, and this of a heavy density. Intending growers should consider the position before taking definite steps in the matter.

Ginger growing has occupied the attention of the residents of Buderim Mountain and surrounding districts for many years, and it is known that a present resident of Buderim successfully grew ginger forty years ago. Perhaps one of the most experienced growers at present in that district is Mr. A. J. Burnett, who has been

growing ginger for the past twenty years. This gentleman's property is situated on the western slopes of Buderim Mountain, at Glenmount, and he has approximately an acre under ginger. The soil is a medium clay loam, and is distinct from the typical red volcanic soil usually associated with Buderim Mountain. Ginger, when properly cultivated and fertilised with heavy applications of bone dust, can be produced on the slopes of Buderim Mountain of a quality superior to the ginger imported from China, and with the advantage of being fresher than the imported article. Mr. Burnett states that he has produced up to 5 tons per acre, and that 4 tons is regarded as an ordinary yield under favourable conditions. His practice is to prepare the area well ahead of planting, which should take place in October. The ginger is planted in drills (previously fertilised) spaced 2 feet apart with 9 inches between the sets which are planted at a depth of 3 inches. Plant ginger, which shows signs of growth, or as it is termed "shot" ginger, is preferred for planting purposes. Immediately following on the planting, a heavy mulch of grass is applied to the whole of the area, but not just immediately over the sets. Thus the appearance of a newly planted area is practically a mat of grass to the depth of 2 to 3 inches. It requires approximately 1 ton of plant ginger to plant an acre on the lines advocated.

The object of the mulch is threefold—(a) It retains moisture in the soil, (b) it retards and keeps down weed growths, and (c) it gives an added pungency to the ginger.

Little or no weed growth will appear if the initial preparation of the soil has been thorough, and any such growth can be easily and readily handled.

Green ginger which is required for confectionery purposes needs to be harvested at an earlier period than that which is utilised for drying—jam and chutney and other manufactures—and when harvested for this purpose the yield obtained is only about half that produced when the rhizomes are allowed to mature.

Young ginger is both tender and free from fibre, which is objectionable for preserving purposes.

Ginger intended for plant purposes can be left in the soil until the approach of the planting season, and will then be in a better condition for planting.

Harvesting of matured ginger takes place subsequent to the flowering period and when the tops have dried off. For the lesser matured article it is necessary to lift the crop well ahead of this period, usually in April, when the first flowers put in their appearance. An examination of the hands and rhizomes to ascertain the state of maturity, however, must be the true guide.

Owing to the need for care in lifting the crop the whole operation is one which can only be carried out satisfactorily by hand. This, of course, tends to add to the cost of production, but is at present—and until some machine is perfected which will do the work satisfactorily—unavoidable.

As an adjunct to fruitgrowing and other industries in those districts which have a soil and climate suited for ginger growing, the crop has much to commend it, and provided that growers, as a body, will co-operate with the object of maintaining a high standard of ginger, there should be no reason (when the supply equals the demand) for importations to continue.

The need of caution in the future to prevent over-production, however—as Queensland cannot hope to compete in an export trade—is imperative.

## THE DAIRY HEIFER.

The dairy heifer is a unit of the potential milking herd. The breeder who knows how to grow and handle dairy heifers will add substantially to his achievement with his dairy herd.

The demand for reproduction and milk production are so heavy on high-producing dairy females that every opportunity must be given for growth and development before the animal begins her lactation period.

Improper feeding and breeding at too early an age are two factors to avoid.

The time to take advantage of the growth impulse is when it is most potent, and when demands for milk production do not interfere with its influence.

Do not allow the dairy heifer to get a setback by turning on to scant pasturage or by improper feeding.—C. F. McGRATH, Supervisor of Dairying.



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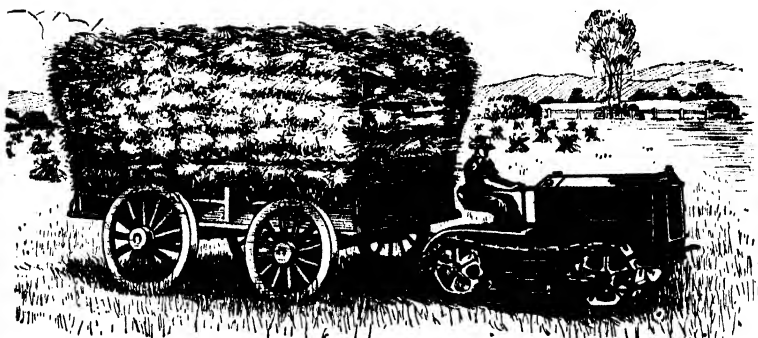


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CK 209

## THE CONSTRUCTION OF MOTOR TYRES. ENSURING GOOD SERVICE AND DURABILITY.

By RADIATOR.\*

Fabric or canvas consists of interlaced cotton strands known as warp and weft; the warp being the longitudinal strands, and the weft the cross strands. When fabric is used as the base for a motor tyre, considerable friction is caused in these interlaced cotton strands.

Consider a tyre rotating as the car moves. The portion of the tyre touching the ground is slightly flattened. This flat portion keeps on moving around the tyre as the wheel rotates. The result is that every portion of the circumference is pressed in slightly and allowed to expand again once for each revolution of the wheel. The degree to which the tyre is inflated, of course, affects the extent by which the tyre is flattened; naturally balloon tyres are flattened much more than high-pressure tyres. This constant flexing of the tyres naturally causes internal friction in the tyre.

In the case of the fabric tyre the constant flexing causes the interlaced strands to rub the one against the other, and as well as generating a lot of heat by friction, the strands also chafe. The heat generated causes the rubber to over-vulcanise and so become rotten. On account of these defects the fabric tyre is only suited for high pressures where the amount of flexing is extremely small.

The cord tyre overcomes the defects of the fabric tyre as follows:—There being only longitudinal cords in each ply, the friction between interlaced strands is entirely removed. Also the cord tyre provides a ready means of surrounding each cord with rubber which takes up the flexing without generating any heat or any chafing.

The comparison between the two tyres will be better understood when the construction of the tyres has been explained.

After the cotton cords have been cleaned at the tyre factory, they are impregnated with the very best of rubber; this means that each cord is surrounded with a film of rubber that will act as a cushion when the tyre is flexed. The process of impregnating the cords is known as "proofing."

In the case of fabric, the material is spread with a coating of rubber, but it is obviously difficult to separate each strand from its neighbour in the fabric.

The tread is always of hard rubber, and is placed on the tyre in various ways by different manufacturers. Sometimes the tread is extruded complete in one piece, and placed upon the tyre, whereas other treads are made up in layers. The tread is arranged so that the periphery has the thickest rubber, while the edges taper away to nothing.

In the single cord process, the whole tyre (including the tread) is vulcanised together. This method produces a satisfactory tyre, but the objection is that any flaw in the vulcanising of the casing will be undetected.

In the double cord process the casing is vulcanised in one operation, and the tread is vulcanised on in the second operation.

The vulcanising takes place in a metal mould. It is in this process that the various designs of tread are imprinted on the outside. While in the mould the whole tyre is heated with steam and at the same time subjected to an enormous hydraulic pressure (about 2,000 lb. to the square inch). This vulcanising process causes the whole tyre to weld together into one mass, and if the vulcanising has been a thorough success there should be no blisters in the rubber.

This description of the manufacture of tyres will probably explain to the reader why tyres are so expensive. Although the making of tyres is a scientific process, the reader must not think that good tyres cannot be made in Australia. Good tyres have, and are, being made in Australian factories. The raw material is, of course, imported, but it is hoped that in the near future Queensland will provide the necessary cotton at least.

The development of tyres has probably contributed most, in the last fifteen years, to the progress of motoring. In 1913 it was quite possible to procure a reliable car, but the tyres of that time were certainly a worry. Punctures and blow-outs were extremely numerous, and the motorist who made a 200-mile trip without tyre trouble was more fortunate than the one to-day who does 2,000 miles without trouble.

\*In the "Farmer and Settler."

To conclude this article a few words about the preservation of tyres will probably be in season. The following points should always be adhered to:—

- (1) Keep the tyres inflated to the correct pressure; an air pressure gauge is an essential accessory.
- (2) Never run on a flat tyre, even for a short distance. It is far better to remove the tyre and run on the bare rim.
- (3) Keep the tyres and tubes free from grease and oil, as these two destroy rubber.
- (4) Make sure that the wheels are always correctly aligned. To run a car with the front wheels badly out of alignment will mean that the tyres will be ruined in a hundred miles. Even a little inaccuracy in alignment greatly shortens the life of the tyres.
- (5) Always keep the brakes equally adjusted and capable of being easily applied.
- (6) Drive carefully. This last item is the most important of all. Never accelerate or brake suddenly, do not skid around corners, and never take a corner more sharply than necessary. Do not race uphill in gear. Every time that the wheels bounce off the ground they race and tear off a piece of rubber as soon as they again touch the ground.

If the tyres are well cared for, and the car carefully driven, the tyre life will be double that obtained if the tyres are not considered. Having regard to the price of tyres, the care is well worth while.

## BREEDING AND SELECTION OF DAIRY STOCK.

By C. F. McGRATH, Supervisor of Dairying.

The industry needs better cows, and the dairy farmers and breeders must breed and rear the better cows, because they do not now exist to the extent required.

The foundation of the dairying industry for the future must be laid now in the breeding and rearing of high-class dairy stock.

That this work can be done with the degree of success its importance demands is evidenced by the success attained by many breeders of high-class dairy stock in this and other States of the Commonwealth.

Breeds of dairy cattle have been in existence for many years past, but the stud master of to-day breeds on dairy lines by selecting and mating animals whose parentage have high production records.

Pedigrees alone do not indicate the quality of milk and butter fat that a cow will produce. Such characteristics are the animal's heritage, and by careful dairying Nature's gift to her can be developed to its full capacity.

A successful stud master knows that a certificate of registry in a herd book is not evidence of high dairy production, and he realises that selection is not confined to pedigree. Attention is given to the constitution, production, conformation, and general characteristics of the animals selected from which to breed.

It is important that the constitution be sound, and this is indicated by large, well-developed lungs and a broad and deep chest. A sound state of digestive organs is important and has a great influence on all the functions of the body, and more especially on the secretion of milk.

Dairy type and conformation are readily discernible by the trained eye of the stock breeder. An animal of the desired type and character attracts and fills his eye and is then subjected to a close examination for the points and characteristics essential in good dairy animals.

A knowledge of the development of dairy qualities in cattle is a valuable aid in the selection and breeding of dairy stock.

The development of dairy qualities in the female begins by exciting the udder to unnatural activity by stripping it at frequent and regular intervals of all the milk secreted.

Care in handling and proper feeding are essential to produce high-quality dairy animals, and if supplemented with a sound knowledge of selection and breeding the desired characteristics will be transmitted to the offspring.

Such prepotency is to be obtained by line dairy breeding rather than by simply breed breeding.

### **Breeding.**

A great deal has been written on breeding, and many breeders have contributed to the literature on the subject and quote pedigrees and discuss high-class animals that have been inbred. Such results invariably reflect the intelligence of an experienced stud master.

Disastrous results have invariably followed inbreeding of dairy stock when practised by the inexperienced stock breeder, as is evidenced by the numbers of nondescript animals to be seen in many districts.

There are several methods of breeding, as practised by stud masters—viz., inbreeding, line breeding within distinct families, line breeding with distant strains of the same blood, and outcrossing, which is the continued introduction of fresh blood.

Inbreeding is the practice of mating closely related animals such as sire to daughter, son to dam, brother to sister.

It is considered that an animal is inbred when its parents have 50 per cent. or more of common ancestry in the pedigree.

The purpose of inbreeding is to fix or intensify desirable characteristics or qualities in animals so that they will more consistently transmit such characters to their offspring.

Many high-class flocks of sheep, herds of cattle, and breeds of horses have been established by inbreeding.

Such successes have been achieved by stock breeders who possessed an intimate knowledge of the breeding and general characteristics of the animals mated, a natural aptitude for their work, and the gift of observing the good and bad points of the selected animals.

The problem confronting the stud breeders is to choose animals that possess outstanding desired characters and to eliminate from the breeding operations those animals which possess undesirable characters. Skilful selection of the animals to be mated is the all-important factor in purifying the hereditary make-up of the individual in a herd, and for intensifying type and breed characteristics that will ensure that the offspring will inherit the character of the parents, to a degree equal to or better than their parents.

### **Line Breeding.**

Line breeding may be differentiated from inbreeding as defining it as the mating of two animals identical to the extent of 25 per cent. and less than 50 per cent. of their blood. Line breeding is a popular practice with breeders, as it is not accompanied with so great a risk of reproducing and fixing undesirable characters as is associated with inbreeding.

Line breeding within proved strains of blood is a safe method for breeders desirous of improving their herds. The system widens the opportunities of selecting animals with desired characteristics.

### **Out Crossing.**

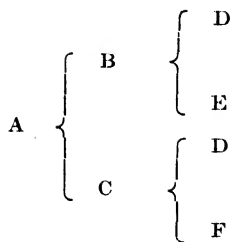
Outcrossing is the mixing of strains of blood within one breed by mating animals entirely unrelated or having less than 25 per cent. of common ancestry entailing a continuous change of blood.

This method of breeding is frequently disappointing unless controlled by an experienced breeder. Ability to select sires with the characteristics necessary to maintain or improve the standard of the herd to which he is mated is essential, otherwise the more fresh blood that is introduced the more uneven in character will the herd become, though a few high-class animals may be bred.

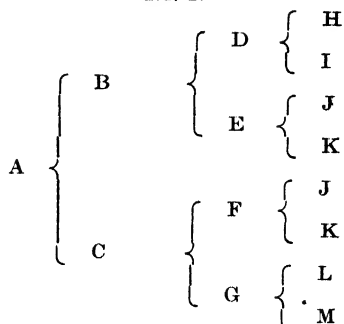
A study of Mendel's laws of heredity will enable the breeder to readily understand why the outcrossing method is often unsuccessful and misleading to the young and inexperienced breeder of live stock. The pedigrees tabulated below clearly indicate the difference in the methods of breeding.

## INBREEDING.

No. 1.



No. 2.

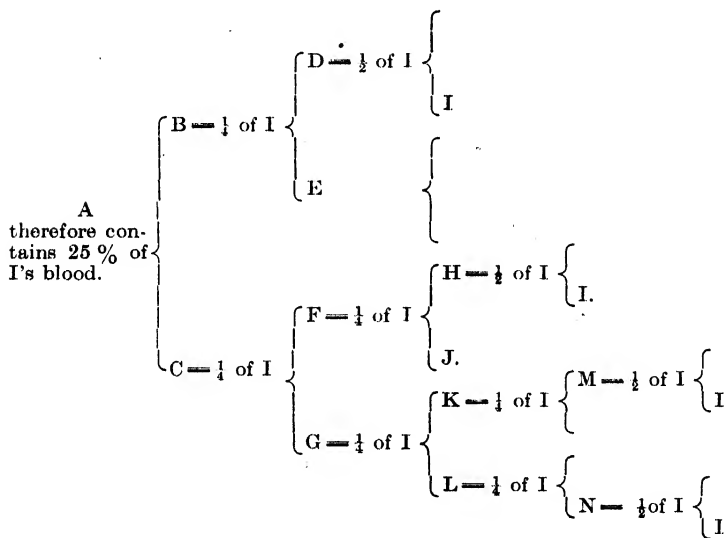


No. 1 tabulation indicates that A is inbred as son and daughter of sire D mated.

No. 2 tabulated example indicates that E the dam of B (sire) and F the sire of C are full brother and sister, so that B and C the sire and dam of A are first cousins in blood.

## LINE BREEDING.

No. 3.



No. 3 tabulation indicates that A has been line bred to dam I. The dam G having two lines of blood to I has been mated with F, whose sire H is a son of I, and the progeny C has been bred to the sire B who is a grandson of I.

In this case line breeding with distant strains of the blood of dam I has been carried out, and there has been sufficient latitude to allow faults to be eliminated and desired characteristics to be fixed by selection.

By this method desired individual characteristics of animals can be retained or intensified in the progeny.

The breeder should make up his mind as to the breed he considers most suitable and which he desires to establish, and then select the foundation stock from breeders whose stock come nearest to his ideal.

A keen observation of the animals he is breeding will enable him to cull his herd and select sires to fix type and character which are essential to success. Sound judgment in selection and mating and judicious feeding are necessary in the successful establishment of a profitable dairy herd.

**THE GROS MICHEL BANANA IN NORTH QUEENSLAND.**

W. J. ROSS, Assistant Instructor in Fruit Culture.

Notwithstanding the Gros Michel banana (known also as the "Fijian," "Jamaican," &c.) has been grown in a limited way for a number of years in North Queensland, there are many people who are not acquainted with its characteristics and excellent qualities, much less its requirements from the cultural standpoint. Tests conducted some time ago and followed by observation extending over a long period have established its value as a commercial fruit, and also the suitability of many localities in different parts of the North for its successful cultivation. Its claim for attention, as regards the growing of it on a much greater scale than hitherto, is now being recognised as evidenced by the number of applications for plants received by those in the position to supply.



PLATE 178.—FINE HAND OF GROS MICHEL BANANAS, SHOWING LENGTH OF FRUIT.

The intention of this article is to submit to the readers of the Journal a few observations, together with illustrations, which might be of interest if not of useful guidance to those contemplating entry into this branch of fruit production.

**Characteristics.**

Conspicuous among its characteristics when compared with the Cavendish variety are:—Its tall growing habit, often attaining a height of 30 feet from the ground to the tip of the uppermost leaves; strong growth, having stems 4 feet and more in circumference at the base; open structure of the bunches, affording more room for the development of the fingers or individual fruits which are usually very large and less curved than the Cavendish; and, lastly, what may be regarded as its most desirable characteristic, the thickness and toughness of the skin of the fruit which renders it capable of withstanding to a greater degree the ordeal of reaching distant markets in a more saleable condition than is the case with Cavendish.

**Importation of Plants from Fiji.**

It was this variety that popularised the trade between Fiji and Australia in the past, to the detriment of our Northern industry, which was almost wholly confined to the growing of the Cavendish variety. In order to frustrate as far as possible the increasing popularity of the Fijian banana on the Southern markets in those days, the Mourilyan Syndicate and also the Department of Agriculture and Stock imported into this State, during the years 1909 to 1912, a quantity of Gros Michel plants which were to be the foundation stock from whence supplies of plants could be distributed as required. A propagating area was established at the Kamerunga State Nursery (long since closed), and from this institution plants



PLATE 179.—PORTION OF PLANTATION OF GROS MICHEL BANANAS, 12 MONTHS AFTER PLANTING.

were sent long distances. The accompanying illustrations, taken quite recently on Mr. P. Monaghan's plantation at Kennedy, depict the progeny of the original imported plants, some of which were sent to the Cardwell district.

**"Panama Disease."**

It is generally recorded that the Gros Michel is subject to attack by what is called "Panama Disease" (*Fusarium cubense*), a very serious malady in countries where this variety is extensively grown; but it is noteworthy that during the time this banana has been grown in parts of North Queensland, continuously since 1910,

no serious symptoms of disease other than those associated with Cavendish have been recorded. On Mr. Monaghan's property, as well as in other plantations in the Cardwell district where this variety is grown, there are no apparent indications of the presence of "Panama."

#### Limitation of Growth.

It may be asked, why this banana was not more freely grown by the Chinese growers in the north years ago. The answer is, firstly, that it was not until it was too late to stop the decline of the Northern industry, that importations of plants were made. Secondly, the expansion of the sugar industry and the keen competition for the class of land which was favoured by the Chinese for the growing of bananas were then taking place. Further, the amended Land Act, restricting the ownership



PLATE 180.—GROS MICHEL BANANAS, SHOWING HEIGHT  
AT WHICH BUNCHES ARE BORNE.

of land to not more than 5 acres in the cases of unnaturalised Chinese—together with the growing popularity of Fijian fruit on the Southern markets and consequent poor returns to Northern growers—assisted to deter the opening up of new plantations in areas not immediately required for sugar and where facilities for transport were available. Again, the Cavendish or Chinese banana, as it is sometimes called, had in the latter sense of the term, an attraction for Chinamen, Chinese growers were disinclined to change over from the growing of the Cavendish variety.

The reason why it is not grown in the Southern districts is due to the fact that it requires a tropical climate and well-sheltered locations. It would be slower to grow and mature its fruit than the Cavendish if grown in Southern districts where the latter succeed.

### Directions for Planting.

When planted in congenial locations fruit from the Gros Michel are ready for market in from twelve to thirteen months after planting. The plants should not be set out any closer than 15 feet apart each way. Select a well-sheltered location, preferably flat land rich in humus, for the plantation. Basin flats with high surrounding banks, such as are found contiguous to rivers and creeks, are ideal if not subjected to too severe flooding. Shelter afforded by ranges of hills, or by leaving heavy belts of scrub surrounding the area to be planted is also to be considered.

Choose club-shaped plants, i.e., those tapering to a sharp point at the apex and having large butts. The depth at which plants are placed in the ground is governed by the size of the plants used; but if allowance is made when digging holes to admit of there being a basin from 4 to 6 inches deep left around the plant after the corm has been covered by 3 or 4 inches of soil, the operation will have been satisfactorily performed. The basin left around the plant will fill in during the course of later cultivation, which consists mainly in suppressing weed growth and retaining a good soil mulch to aid conservation of moisture.

On account of the height at which the bunches of the Gros Michel are borne, some difficulty might be experienced at the time of harvesting. The method usually practised is to make a V-shaped cut about three parts through the stem of the plant and on the same side as the bunch is hanging. The head of the plant with the bunch gradually falls over, and it may be further steadied by placing a forked stick under the stem and lowering as required until the bunch can be handled and severed from the plant. The bunches are then treated with the utmost care, while all subsequent operations such as dehanding, sweating, grading, and packing are carried out in as careful and thorough manner as possible.

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## WEEDS OF QUEENSLAND.

By C. T. WHITE, Government Botanist.

### BUTTON WEED OR BUTTON MALLOW (*Modiola caroliniana*).

**Description.**—A weed of one or several years' duration, the stems freely branched and procumbent or more or less ascending, 6-18 inches long, stems and leaves covered with scattered hairs. Leaves orbicular in outline but much cut and divided, mostly about 1-1½ inches across, on slender stalks of up to 2½ inches in the lower leaves. Flowers solitary in the leaf axils, on slender stalks of about the same length or longer than the leaf-stalks; spreading flat, about ½ inch across. Petals 5, red. Fruits composed of about 20 carpels, the carpels blackish when ripe and clothed on the back in the upper part with rather long bristly hairs.

**Distribution.**—A native of Central America, the West Indies, and the warmer parts of South America and the United States, now widely spread in other parts of the world as a naturalised weed.

**Common Names.**—Button Weed, Button Mallow, Red Mallow, Bristly-fruited Mallow, and Creeping Mallow are names variously applied to it.

**Botanical Name.**—*Modiola* from Latin *Modiolus* (dim. of *modius*, Gr. *modius*) the Roman corn measure, the fruit shaped like a bushel measure; *caroliniana*, a native of Carolina, U.S.A.

**Properties.**—Like other members of the Mallow family it no doubt has some value as a fodder.

**Eradication.**—The plant is not a particularly aggressive weed in Queensland. Cutting off well below the surface of the ground is sufficient. If any part of the crown is left it shoots up numerous strong wiry stems.

**Botanical Reference.**—*Modiola caroliniana* (L.) G. Don. Gen. Hist., Pl. 1, 466, 1831. *Modiola multifida* Moench. Melh. 620.

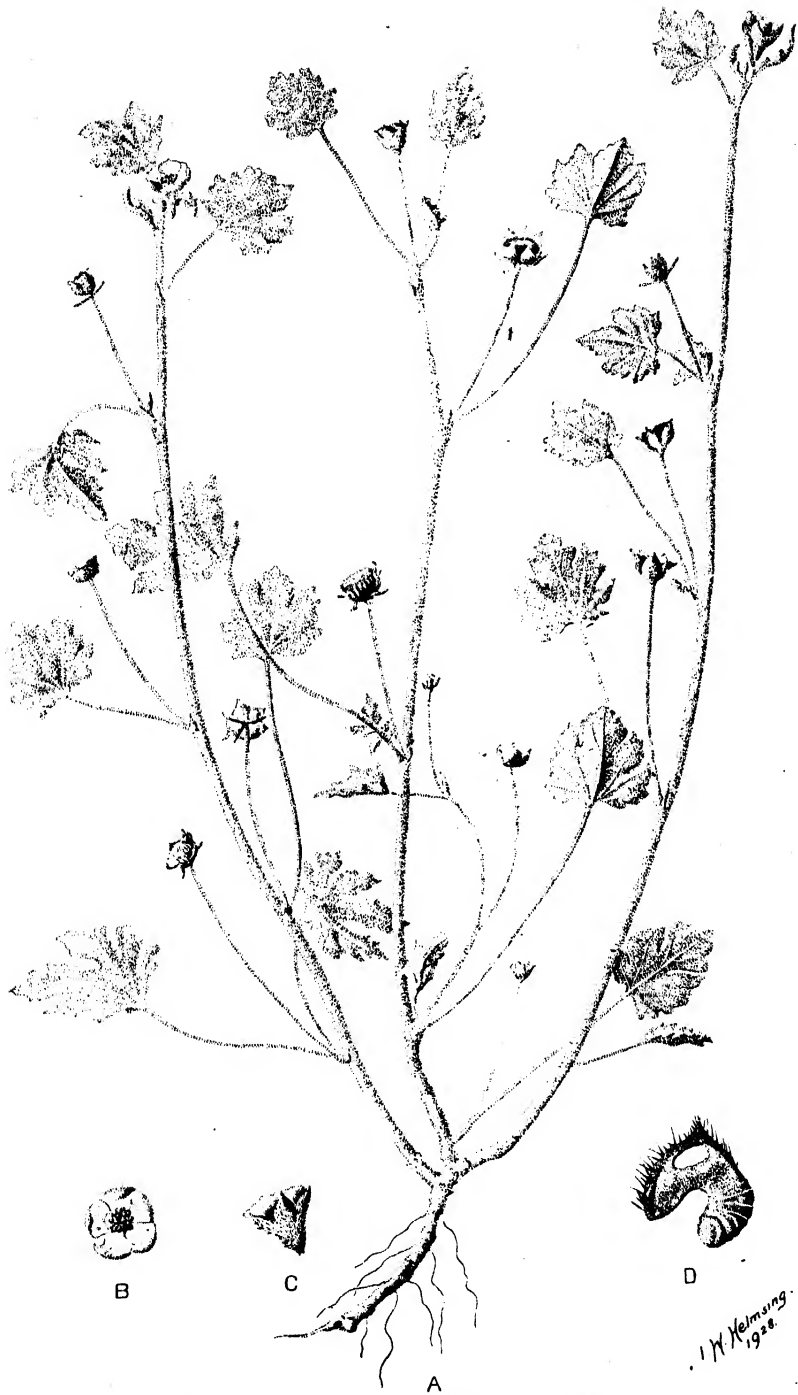


PLATE 181.—BUTTON WEED (*Modiola caroliniana*).

- A. Plant about half natural size.
- B. Single flower (face view).
- C. Single flower (back view).
- D. Ripe carpel containing seeds.

## .    **PIG TRANSPORT.**

E. J. SHELTON, H.D.A., Senior Instructor in Pig Raising.

The transport of stud pigs by horse-drawn or motor vehicle or by rail or steamer requires that they be comfortably accommodated in roomy crates, provided with ready means of entrance and exit and with a convenient food trough. The accompanying illustration serves to convey to the reader the care exercised and the provision made by Queensland State Farms and other Government institutions in the crating of stud pigs for transport purposes to all parts of the State.

The excellent condition on arrival that is frequently specially mentioned by purchasers of stock from these farms, and the absence of any loss in transit is a testimony in itself to the methods adopted. It will be noted that large airy crates are built, fitted with sliding entrance door and roomy feed trough; the crate is covered with sound bagging protection for tropical conditions—a special feature where stock have often to remain in the open at wayside stations or be conveyed to the farm some miles distant.

It will also be noted that the crates are suitably stencilled with the particulars of the stock and the breeder's name and address, thus presenting a neat and attractive consignment which in itself cannot fail to attract attention.

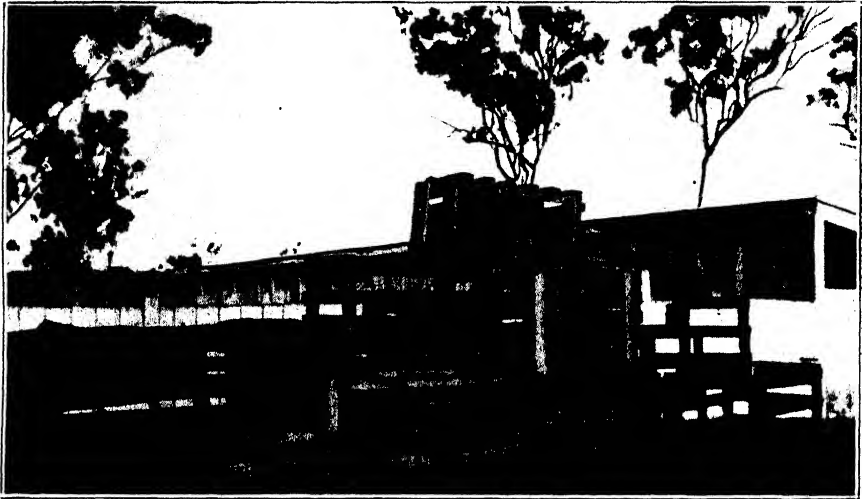


PLATE 182 (Fig 1).—A STACK OF PIG CRATES READY FOR DESPATCH.

Attention to all matters of detail counts much for success in matters associated with the breeding and sale of stud stock. The successful men are the ones to whom all this detail is a pleasure as well as a business. Nothing pleases a buyer more than to have his purchases arrive in an attractive condition, for the arrival of fresh stud stock invariably creates considerable interest among the farming community. The farmer who receives a stud boar or sow in good order and condition in a neat, attractive, stencilled crate, and who can take the pig's pedigree from his pocket-book and exhibit it for the benefit of his neighbours, is certainly doing not only himself but his district a good turn, for much depends upon the success of such purchases. If they are a success good business results; if they are a failure the stud pig business receives a rather hard bump.

It is up to breeders, therefore, to see to it that their stud stock go out to buyers in convenient, roomy utility crates—crates that can be made use of for other purposes than for the mere transport of pigs from station to station or from farm to farm.

Full details as to the size of crates, their approximate cost, &c., can be supplied on application to the Department of Agriculture and Stock, Brisbane.

### Speedy Return of Crates.

Breeders should pay strict attention to the immediate return to vendors of crates used in the transport of breeding stock, for, unless this matter receives immediate attention, vendors are placed at a considerable disadvantage and are compelled to have a larger supply of crates than would be necessary if their crates were returned immediately after use.

To the breeder despatching only one or two pigs each month or quarter, this may not appear to be an important item, but to the breeders of stud stock, who carry on business on a large scale, it is an exceedingly urgent matter and one that should not be lost sight of in these transactions.

As the stud pig business is developing rapidly and as more stud pigs are now being handled than ever before, the crate problem becomes a more important one and one which causes many breeders great concern. If it cannot be arranged that the crates be returned immediately, purchasers should inform vendors by letter so that they will not be making unnecessary journeys to the local railing station in search of returned crates.

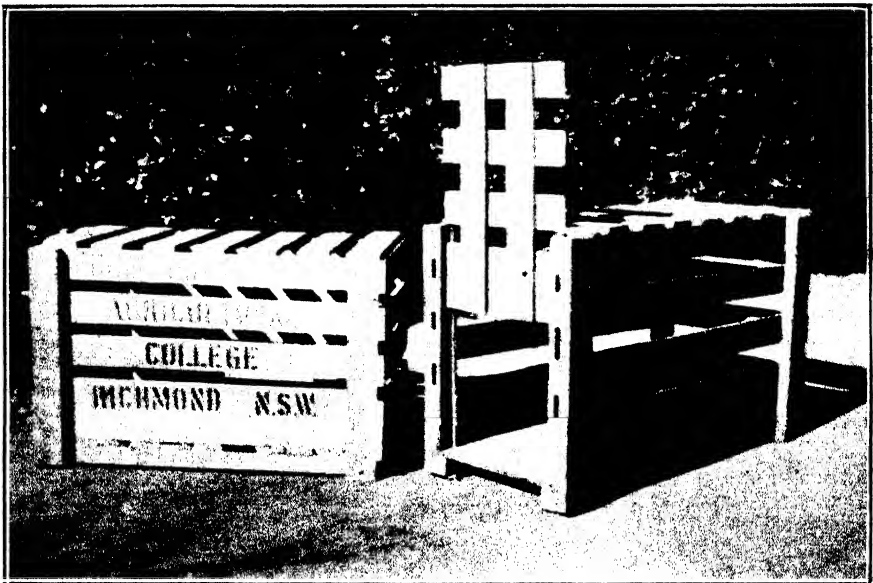


PLATE 183 (Fig. 2).—THE TYPE OF PIG CRATE RECOMMENDED FOR USE IN THE TRANSPORT OF PIGS PER RAIL, ROAD, OR STEAMER.

Note style of door and attractive stencil of breeder's name and address. The trough does not show in this illustration.

Bacon factories, which receive a few pigs in crates, are always prompt in attending to the return of the "empties," otherwise their business would be checked.

It is equally urgent that, when purchasers do return crates, they should inform vendors by letter, so they will be on the lookout for the crates. It is worthy of consideration that sales of stud pigs should be on a basis of delivery in crate on rail, free of all charges at purchaser's station. Such a system would save endless worry and annoyance. In actual practice, it is quite possible and satisfactory.

### Crates Should be Kept Clean.

Stud pig-breeders should be careful to thoroughly disinfect crates prior to despatch of stud pigs, and to be especially careful to redisinfect them again on arrival at the home farm. This is necessary by reason of the fact that hog lice, the most prolific and persistent of the external parasites of the pig, breed not

only on the pig's body, but also in cracks and crevices in the sties, roofing and partitions, as well as in pig crates, especially those that have been used for the conveyance of pigs that were infested with these parasites.

Complaints have been made on several occasions of specially selected stud pigs arriving at their destination "smothered in lice." Nothing is more disgusting to the purchaser and the enthusiastic beginners in the business than to receive specially selected valuable animals in such a condition. In fact, it gives the breeder a considerable set back, and, incidentally, paves the way for the introduction on to what is probably a clean farm of a host of parasites, which rapidly accommodate themselves and, in the course of a few hours, are breeding and thus increase their numbers. Frequently when the animals left the vendor's farm they were crated and guaranteed free from lice, though the vendors quite forgot to examine the old empty crates, which were used in despatching stud pigs. Such carelessness causes a great deal of harm to the vendor as well as to the industry as a whole.

### **Food Troughs in Pig Crates.**

It is absolutely essential that breeders should provide a suitable food trough in all crates used for the transport of pigs by rail, road, or steamer. The food trough should be constructed so that it is capable of being used also as a water-trough. It is a decided advantage, too, where railway regulations permit, to provide some form of bedding in the crate, even if it is only clean, dry sawdust or moist sand. It will be argued, of course, that the latter would considerably increase the weight of the consignment, but generally the freight charges on crates are rated on a measurement, and not a weight basis. This is particularly so in large crates where the weight by measurement is invariably greater than if the crates were actually weighed.

In connection with the food-trough, it is suggested where the pigs are to be forwarded over long distances, that a supply of food (pollard and bran in equal parts preferably) should be placed in a sugar-bag and tied to the crate in such a way as to be readily accessible for use as required. A note attached to the waybill, asking that the food be mixed with water and given to the pig or pigs at certain specified stations, is also suggested.

The use of a stiff label attached to the crate, asking that the animals be given food and water, invariably results in attention being given as required.

### **Prompt Advice re Despatch.**

Prompt advice concerning the despatch of this class of consignment is essential. Delay and annoyance is possible and additional risk is incurred. It is advisable to forward a telegram or letter, which insures as far as is humanly possible, satisfaction to both parties.

### **Freight Charges.**

In cases where it is necessary to prepay freight, it is advisable to add the approximate amount to the price quoted for the animal and to effect the sale on a F.O.R. (free on rails) destination basis in preference to a F.O.R. sender's station rate. Delivery at destination is suggested in order to avoid the necessity of collecting freight after delivery has been given. If the purchaser's station is one at which permanent officials are stationed, freight may be charged and collected by the officials before delivery is given.

It would be a much better proposition if stud pig-breeders generally would quote for their stock on a cash with order basis, delivery to be given in crate at purchaser's station, all charges paid to that station. Many breeders will, of course, consider this quite an impossible proposition, but it has been found from experience that once the system is a practice and is explained to purchasers, it is superior to the return of crate method, which will always prove to be an unsatisfactory scheme.

### **Protective Covering over Crates.**

Reference is made in the description of crates illustrated in Fig. 1 to the advisability of providing a hessian cloth cover over the top of the crates to ensure at least some protection from the rays of the sun, whilst the crates are awaiting delivery at senders' or purchasers' stations. This need not be an expensive item. An old chaff bag would be better than no covering at all.

### **Doors at Both Ends of Crate.**

In crates used for the transport of mature stock or for large animals, it is a decided advantage to have a movable door at each end of the crate and to have this door effaced in such a manner that, when the "catch" or "pin" is released, the door may be readily lifted out to permit of the free ingress or egress of the animal. Such movable doors are not difficult to construct and are a decided advantage. Their addition need not necessarily increase the value of the crate very much. It is an advantage, too, where possible, to provide suitable handles at each end of the crate to allow of the crate being more readily moved about. For preference, these handles should be arranged so that they are movable, and may be turned down out of the way when crates are being packed in trucks.

### **Side Boards.**

It is advisable that the lowest board on the side of the crate be at least 6 inches in width and that it be nailed or bolted close to the flooring boards. Where these lower boards are above the flooring, even if only 1 or 2 inches, the pigs' feet are liable to become injured by being forced through to the outer edge and becoming "jammed" if the crate is bumped or knocked about. Where boarding is used in the crate it is a decided advantage in ensuring that the bedding is not forced out of the crate.

### **Legs on Shipping Crates.**

Most coastal, interstate, and overseas shipping companies require that shipping crates be provided with stout legs permitting of an open space of at least 4, and in some instance 6 inches underneath the crate. It would be advisable for breeders or their agents, who are concerned in the shipment of pigs in crates, to ascertain the regulations before arranging the delivery of the pigs at the wharf. The railway regulations governing consignments may be ascertained on application to any station-master, from whom consignors will receive every courtesy and assistance.

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## **"THE FARM PRODUCE AGENTS ACTS, 1917 to 1928."**

The first Farm Produce Agents Act was passed in 1917, the objective being to ensure supervision over farm produce agents in their dealings with those for whom they were acting as selling agents. It was found that this Act did not meet all requirements, and, with a view to remedying defects and to render its administration more effective, the Minister for Agriculture and Stock (Hon. W. Forgan Smith), during the last session of Parliament, introduced an amending Bill. This measure was passed through all stages, and has now received the Royal assent.

The chief amendments relate to the keeping of trust accounts by agents, the prescribing of the books and records of transactions and their inspection by authorised persons, and the payment to principals of the proceeds of sales within a given period.

It is provided that all moneys received by an agent in respect of the sale of produce on behalf of a client shall be paid into a special trust account called the "Farm Produce Account." The Department of Agriculture is to be notified of the name of the bank in which this trust account is kept, while production of the pass-book relating to the account can be demanded. Money paid into the trust account is protected and is not available for the payment of any other creditor.

An important clause is that which requires the principal to be paid within thirty days of the date of sale of the farm produce. There is nothing in the Act to prevent the agent paying his client as early as he pleases, but he must not delay payment beyond thirty days.

Power is given to prescribe the books and records of transactions which are to be kept by agents. Books, including the pass-book of the trust account, must not be destroyed for at least twelve months from the date of the last entry therein. The Department has power to inspect these books and records with a view to seeing that the law is being carried out or to investigate the complaint of an aggrieved party to whom the Minister will have power to communicate the result of such inquiry.

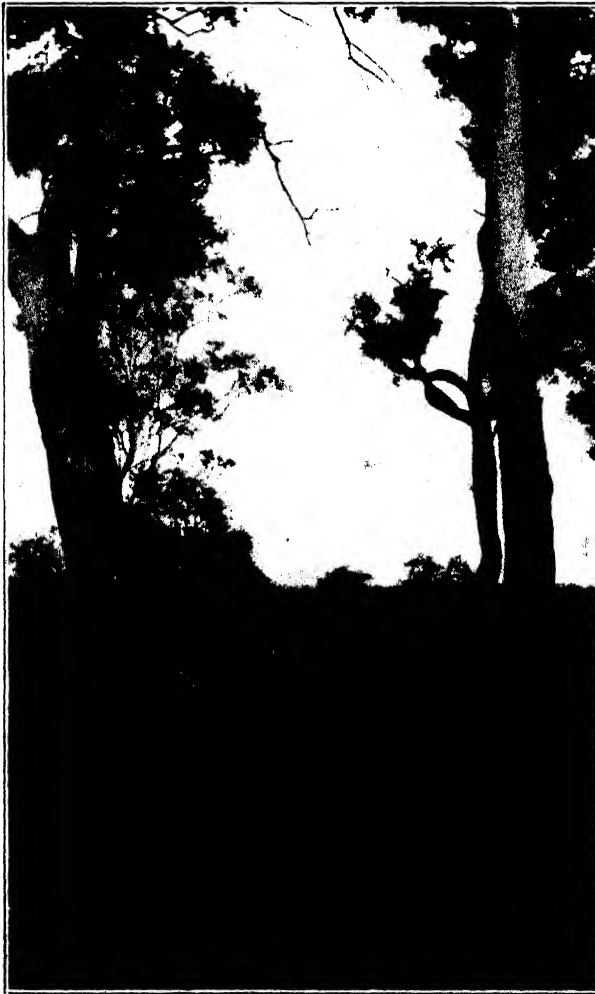
The rendering of fraudulent account sales will make an agent liable to imprisonment for three years, or a penalty not exceeding £100.

The destruction by an agent of any farm produce which is in a marketable condition is an offence under the Act.

Where any offence against any of the provisions of this Act is committed by a corporation or joint stock company, the chairman of directors or manager or other governing officer is liable to the punishment provided unless he proves that the offence was committed without his knowledge or connivance and without any negligence on his part.

An applicant for a license must satisfy the licensing court that he is a fit and proper person to hold a license. He must notify the Department of the address of his registered office, and affix a sign on his premises bearing the words "Licensed Farm Produce Agent." The fixation of commission charges has been left in the hands of the Board of Trade and Arbitration. There is nothing in the Act to which any straightforward agent will take exception, nor is there any provision which will in any way curtail the full exercise of their functions as farm produce agents. Most of the agents are carrying on their business satisfactorily, and the amendments to the Act will cause them no concern.

The Act now embodies all features which the administration of the original Act has shown to be necessary or advantageous.



*Photo.: Miss J. Easton.]*

PLATE 184.—IN THE SHADE OF THE OLD APPLE TREES. SCENE ON COOCHIN  
COOCHIN STATION, NEAR BOONAH. MOUNT EDWARDS IN THE CENTRAL DISTANCE.

## MILKING BY HAND.

BY PRIMROSE McCONNELL.\*

Nine years ago, under the "Dairy Farmers' Notes" heading, an article on hand milking was published in the "New Zealand Farmer," but quite lately there have been repeated requests for advice on this very important matter, hence the present article.

While it is true that the milking machine has come to stay, and that it does excellent work under careful management, there are still circumstances under which hand milking is preferable to the machine, not to mention the fact that machines occasionally break down and the human hands have to take their place for the time being.

It seems to be the general opinion that dairy farms will become smaller as time goes on, and if this opinion proves to be correct, hand milking may become a great deal more common than it is at the present day. On a small farm, where the farmer possesses, as a rule, a proportionately small capital, it has to be seriously considered whether the outlay on a complete milking plant is justified, or profitable, and the labour required to keep a small plant thoroughly clean is almost as great as that in connection with a larger one. One man will easily milk a small herd of, say, twelve cows by hand, and the only utensils required in the milking shed are a milking pail and a larger carrying can, the cost of which is a mere trifle, as is also the cost of keeping it in repair.

Further, there is no doubt that, although a well-handled milking plant does good work, and is a present-day necessity in larger herds, it is not as efficient as the best hand milking; no record-breaking cows are ever milked by machinery. On the other hand, a bad hand milker is worse than a second-class milking machine badly handled.

Hand milking is an art and requires undivided attention, energy, and knack. Women, as a rule, make the best hand milkers, as their hands are small and soft.

### Putting the Cow in a Good Humour.

There are several things which have a direct bearing on successful milking, besides skilled manipulation of the hands, and the principal thing is to put the cow in a good humour for the operation. This is accomplished by gentle handling from the time the cows are being driven to the milking shed until they leave it after milking.

A herd of cows should be taught to come when called on and not be rushed with dog and stockwhip. A gentle put and a kindly word have quite the opposite effect to a growl and a blow before the milker sits down to his work.

### Various Systems of Hand Milking.

The first part of the operation, whether the milking is done by hand or machine, is to thoroughly wipe the udder and flank with a damp, clean cloth wrung from some germicide solution; then draw a stream or two from each teat on to the floor or into a small tin containing a strong solution of crude carbolic acid. The object of the latter operation is twofold—namely, the ejection of any germs that may have gained admittance to the outlet of the teats, and to discover whether there is any sign of mammitis. The little milk that is ejected is almost valueless in any case, as it is always very watery and contains little or no fat.

The udders of heavy milkers are often tender, and for this reason the milking should be commenced very gently, always keeping in mind that gentle handling promotes the flow of milk. On the other hand, if the cow is excited through any cause, the reflex nervous action causes the tissues of the udder to shrink, and the milk is held up.

The position of the milker when sitting should be as close to the cow as possible, with his or her head pressed lightly against the flank. Many milkers sit too far away from the cow, and are neither in a position to control her movements, or to manipulate the teats in a proper manner.

When the milker is sitting in a correct position, if the cow has the habit of lifting her leg, the action may be stopped to a great extent, by pressing the arm against the hollow of the hock.

Some milkers milk with dry hands, and others with wet, and I have seen good milking done either way, but the ever-increasing demands of sanitation will soon make wet milking a thing of the past; for my own part, I think it is a filthy habit. It is

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\* In the "New Zealand Farmer" for August.

too well known that comparatively few hand milkers wash their hands during milking, yet, every now and again, the dirty fingers are moistened in the contents of the milk pail. Is such a habit commendable? A good, dry-hand milker never unduly stretches the teats, but the wet-hand milker almost invariably does.

As previously stated, the initial manipulation should be gentle, and the pressure of the hands gradually increased, until the flow of milk reaches its height. Some quite good milkers milk a fore and hind teat together, but it is better to commence with the two fore teats, with the object of developing the forequarters, which are generally smaller than the hind. So far as efficiency of milking is concerned, it does not really matter which way is adopted, as long as the method is the same day after day. When the cow has filled her teats with milk, the action of the milker should be fairly vigorous. The pressure should be upwards, against the floor of the udder, so as to resemble the sucking of the calf as much as possible, and the teats should not be let go until the quarters are empty. A thoroughly efficient, dry-hand milker will never use a finger and thumb, even in stripping out. Whether he gets two, three, or four fingers on the teats, will depend on their size, but in any case, he will hold on to the end without resorting to the finger-and-thumb process.

A learner's muscles are easily cramped, and the temptation to use finger and thumb is, at first, great, but by determination and perseverance the muscles are hardened, and the strain overcome.

Some milkers are in the habit of drawing the teats downwards to such an extent that the whole hindquarters of the cow are kept in constant motion. There should be very little downward pressure—it should be mainly horizontal. When milking, there should be practically no movement of the arms, except such as is caused by the action of the muscles, and the teats should be pressed against the hollows of the hands by the tips of the fingers. Many milkers entirely encircle the teats with their fingers, but a moment's thought will serve to show that this is an incorrect position, because the outlet from the udder is only a very small tube in the centre of the teat, and it stands to reason that the pressure should be exerted on this part principally, and not on the teat as a whole. The hands should enclose more of the udder towards the end of the milking, until the last drop is drawn.

Of course, I am perfectly aware that the milker's patience is often severely tried, and it is more than probable that the poet who writes so charmingly about the milkmaid and her duties, was never inside a cowhouse during milking time, in early spring, when the pastures are young and lush.

Clean, expeditious milking not only increases the yield of milk and butter-fat—it also develops the udder, the result being a gradual increase in the flow of milk. It will not, of course, make a bad milker into a record-breaker. Quick milking is a good test of milking abilities, and results in the largest possible quantities of milk, with the highest percentage of fat, and there is plenty of evidence to prove that the variations of fat contents of milk are to some extent due to bad milking, whether by machine or hand.

Milking three times a day is sometimes a necessity, but, speaking generally, little is gained by it. No farm employee is so worthy of a good wage as an efficient milker. Although his work is not laborious, his hours are long, and his duties apt to become monotonous.

### Stripping.

There is great variance of opinion as to the necessity, or otherwise, of stripping. The result of my own experience, which is a very long one, has led me to conclude that if a cow is once thoroughly milked, no good can be done by stripping; but where there is a number of milkers, some of whom are not trustworthy, stripping is a necessity, and where the milking machine is in use, it should never be omitted.

A careless employee may milk until he can get no more, but his indifferent manner of milking will cause the cow to hold up some of her milk, which the very best stripper cannot make her yield up.

If a cow has sore teats, she requires the greatest patience in handling, and no treatment of the sores will yield good results, except they are thoroughly washed and dried in the first place.

Some cows have very hairy udders, and the unavoidable pulling of the hairs, in the process of milking, causes much irritation, but this may be entirely prevented by the free use of a pair of clippers. Many cows also suffer much, just after calving, from hard, swollen udders, and nothing will cure this as quickly as persistent hand rubbing. An aperient medicine will also be of service.

## PAINTING ON THE FARM.

### SURFACES REQUIRING SPECIAL TREATMENT.

In the painting of farm buildings there are often materials to be covered for which the paint used for timber is not suitable, such materials including cement and galvanised iron.

The paint ordinarily used for house painting should not be applied to new cement, which contains an alkali which will cause the paint to lie on the surface in a treacle-like form—that is, it will not dry, but always remains in a wet, sticky condition.

Untreated cement work should not be painted until it is about two years old except with cold water paint, lime wash, or one of the proprietary lines of paint specially manufactured for the purpose. If desired it can be prepared for ordinary paint by applying two coats of sulphate of zinc. When dry the surface should be brushed down to remove all crystals; it may then be painted in the ordinary way. A very satisfactory priming coat for weathered cement work may be had by mixing one part of red lead to two parts titanium zinc paste.

### Asbestos Cement Sheets.

The foregoing references to cement apply more or less to asbestos cement sheets, for they are principally of cement, and although they contain considerably less free lime, it is inadvisable to paint them when new with ordinary paint without special treatment. It is advisable to allow the sheets to weather for about twelve months and then apply a coat of equal parts of genuine turpentine and hard oak varnish. If to this, a coat of paint consisting of one part of red lead to three parts of titanium zinc is applied, a first-class foundation will be provided for further painting.

In the case of internal surfaces, a coat of preparatory liquid will prepare them for one or two coats of cold-water paint, or the even more pleasing flat oil paint, many attractive shades of which are now available. Cold-water paint may be applied externally in lieu of oil paint if desired. For this purpose it will be necessary to add about one-quarter of a pint of raw linseed oil to the gallon of water paint.

For ceilings, kalsomine is recommended in lieu of cold-water paint. It often happens that repeated applications of this latter material begin to crack and peel off in a very unsatisfactory manner. This cracking does not occur on the walls to anything like the same extent.

### Galvanised Iron.

Under the heading of iron may be included roof iron, guttering, downpipes, tanks, and water pipes. In all these instances the iron is galvanised to prevent it rusting, so that, to some extent, painting is only necessary after the galvanising shows signs of wear. Guttering, downpipes, &c., are usually painted for appearance immediately the building is completed, and with one good coat only. It is better not to paint the roof iron until it has been exposed to the weather for a few years. Because of the continual contraction and expansion due to the extremes of heat and cold, and the want of a good grip or key, ordinary house paint is not suitable. It is always advisable to use a high-grade paint specially manufactured for the purpose.

### Formula for Whitewash.

Obtain, if possible, large pieces of fresh lump lime, place them in a very large bucket or other suitable container, and into this pour hot water. Cold water will do, but hot water is better, as it hastens the slaking. The lime will start to boil and break up. Keep it covered all the time with about half an inch of water. This is important, for if whilst the lime is slaking it is allowed to rise up above the water in a dry powder it will "curdle," a condition tolerated only by inexperienced and indifferent workmen. Before the lime commences to boil fiercely add tallow or common fat in the proportion of about 1 lb. to 14 lb. of lump lime. This makes a good binder which will prevent the wash from rubbing off. If desired, a little yellow ochre may also be added, which will give a cream or buff tint according to the quantity used. When the lime is thoroughly slaked it should be stirred and sufficient water added to make it a little heavier than, say, milk, after which it should be strained and, if desired, may be applied whilst hot.—"A. and P. Notes," N.S.W. Department of Agriculture.

## Answers to Correspondents.

### Testing for Tuberculosis.

J.O. (Stanthorpe)—

The Chief Inspector of Stock, Major A. H. Cory, M.R.C.V.S., advises that the tuberculin test will not seriously affect the milking of your herd, but bailing the cows up every third hour for a period of eighteen hours to take their temperatures after treatment may affect the milk supply, but only very slightly.

### Phosphorus Deficiency in Cattle.

J.H. (Pomona)—

Your inquiry as to the amounts of the ingredients to add to a 100-lb. bag of bonemeal as a lick for stock was referred to the Agricultural Chemist, Mr. J. C. Brünlich, who advises as follows:—

The cattle undoubtedly suffer from want of phosphorus, and no other ingredient like iron, gentian, &c., is at present required. Bonemeal may be used if sterilised, but I recommend crushed Nauru phosphate, which is so much cheaper and contains much more phosphoric acid.

Mix 1 part of salt with 2 parts of Nauru phosphate or bonemeal. You can sprinkle a little molasses on the mixture to make it more palatable. No extra lime is required, and would really be harmful.

### BOTANY.

The following replies have been selected from the outgoing mail of the Government Botanist, Mr. C. T. White, F.L.S.:—

### Soudan Grass—A Useful Fodder.

V. and Son (Miriam Vale)—

The specimen of grass forwarded with your letter is the well-known fodder Soudan Grass (*Sorghum sudanense*), which should be a valuable grass for your district, either as green forage or for hay. Like all, or practically all, grasses of the *Sorghum* group it develops at times a prussic-acid yielding glucoside, and caution should be exercised in feeding it to stock, especially stock that are empty and inclined to gorge themselves on it.

### *Sterculia quadrifida*.

R.A.D. (Orkabye)—

*Sterculia quadrifida* is a tree widely spread throughout Queensland, but it cannot be said to be common in any one spot, and I do not know a common name for it. It is a beautiful tree when in fruit, and the seeds that are removed from the black coating and the inner coating are edible and of a pleasant flavour when fresh.

### Macrozamia.

P.B. (Harlin)—

*Macrozamia spiralis* is commonly known as Burrawang, Wild Pineapple, Zamia Fern, and by other names. It belongs to the family Cycadaceæ, the oldest family of living flowering plants.

In *Macrozamia* the male and female flowers are borne on distinct plants, and both in heads or cones, the cones being composed of a number of scales. In the female cone each scale bears on its lower surface two ovules which later develop into bright red seeds. In the male cone the scales bear on their lower surface innumerable anthers full of pollen.

The plants are generally regarded as poisonous and are very common in parts of Queensland and New South Wales. Another species is common in Western Australia. They cause rickets or staggers in stock. However, the stem, particularly in those species which form a fan-sized stem, contains a lot of starchy matter which can be boiled and used for stock food, the heat apparently destroying the poisonous principle.

**Poisoning of Stock.**

J.T. (Maryborough)—

The specimen forwarded with your letter has been identified as *Rivina levis*, a tropical American plant very common as a naturalised weed in the scrub areas between Gympie and Maryborough. It gives a very unpleasant taste to milk, but apart from that it is not known to possess any harmful properties.

The other plants you mention—the Wild Passion, Wild Peach, and Solanum Seaforthianum (Nightshade)—are known to be poisonous, but in these scrub areas it is often very difficult to trace the poisoning of stock to any one particular species. If the Solanum has been eaten, I should think it was the most likely cause of the trouble.

**PIG RAISING.**

The following reply has been selected from the outgoing mail of the Senior Instructor in Pig Raising, Mr. E. J. Shelton:—

**Lack of Vitamins and Mineral Matters in Food.**

C.C.E. (Cloyne)—

Your boar is suffering from a lack of mineral matters and vitamins in his food, and is generally lacking in bowel and bladder action.

Treatment must first aim at cleaning out the digestive tract and removing any accumulation of undigested food. For this purpose prepare five grains of calomel and one teaspoonful of sugar; mix this in a small ball of moistened pollard and feed to the boar early in the morning. About twenty-four hours afterwards give two ounce packets of Epsom salts in one pint of fresh milk; give this as a drench to ensure the animal taking the full dose. This should effectively clean out the bowels. Feed very lightly on nutritious, appetising food, of which more than half should consist of green lucerne, pumpkins, sweet potatoes, and skim milk. Very little grain is required but allow plenty of clean drinking water and compel the boar to take regular exercise daily. On the third day of the treatment add to the food one dessertspoonful of Nauru phosphate (finely powdered) and ten grains of boracic acid, giving a small quantity of food only when these drugs are being administered. Give the phosphate and boracic acid in one pint of fresh milk in a clean trough.

Mix the phosphate and boracic acid as dry powders first, then add a small quantity of milk to make a paste and thin down with balance of milk for use. Continue with the above for fourteen days; after that add one dessertspoonful of Nauru phosphate daily in one pint of fresh milk.

**WORLD'S BIGGEST PLANE.**

The acceptance by the Royal Air Force of the world's largest aeroplane, the Beardmore "Inflexible," upon its passing all the official tests, brings to light a remarkable story of the British general strike.

The biggest tyres and landing wheels ever built were ordered for the machine from Fort Dunlop just before this prolonged industrial dispute, and, naturally, there was nothing to go on in the way of design. It was a new problem demanding special tools and machinery at a time when many of the sources of supply of raw materials were shut off.

First it was found that in this size the normal type of wheel with spokes was impossible. The technical department at Fort Dunlop had therefore to face the production of an altogether new type of wheel. They had to reject much of the available raw material as quite useless. When the new wheels were finally in being, a special testing machine had to be built for them, because they passed far beyond the limits of any such machine already in existence.

Their breaking load was, in fact, over 48 tons, an astonishing victory in such a time of emergency, and the tyres required for them were of record size—400 mm. by 2,250 mm., or about 16 inches by 7½ feet in diameter.

## General Notes.

### The Role of the University.

"A University is one of the instruments by means of which new ideas and groups of ideas find organised expression; it trains collaborators who work out the implications and corollaries of new ideas; through a network of personal influence it carries new ideas into the professions and public services. In the main a University is mediatory rather than originative, critical rather than constructive. Its strength lies in winnowing new ideas, in interpreting discoveries and disclosures which others have made, in colouring by slow degrees the texture of educated opinion. These are the duties for which the characteristic structure of the modern or modernised University is especially designed."—Sir Michael Sadler.

### Northern Pig Board.

The Minister for Agriculture and Stock (Hon. W. Forgan Smith, M.L.A.) advises that the following nominations for election as members of the Northern Pig Board have been received:—Frederick Henry Hyde, Pearamon; Charles Alfred Hough, Tolga; David Johnston, Malanda; Robert Thomas Croker, Malanda; Robert Campbell, Pearamon. As five members are only required, no election will be necessary.

Messrs. Croker, Johnston, Hyde, and Campbell are sitting members of the present Board, which terminates on the 31st December, 1928.

### Saving Money.

There are many ways of saving money, but one of the best, since we have to spend it on occasion, is to see that we spend wisely, thereby saving pence, shillings, and in many cases pounds that would otherwise go to the other fellow.

In the matter of purchasing household supplies, wire netting, iron, and the many items that are used on farm and station considerable saving can be effected by dealing with the Queensland Pastoral Supplies Ltd., the well-known providers in Bowen street, Brisbane, who supply the public direct.

A glance through their advertisement, which appears elsewhere in this issue, will prove this. Catalogues listing many lines will be forwarded post free on request, and it will certainly pay any producer who has not already received one to write for a copy immediately.

### Staff Changes and Appointments.

Mr. F. W. Dunster, of Toowoomba, has been appointed an Officer under and for the purposes of the Animals and Birds Acts.

Mr. G. Cross, of Goonaro, Hebel, has been appointed Honorary Inspector of Stock.

Constable J. H. Teichmann, of Pentland, has been appointed Inspector of Slaughter-houses.

Mr. G. A. Cameron, Police Magistrate, Townsville, has been appointed Chairman of the Inkerman, Kalamia, Pioneer, and Invieta Local Sugar Cane Prices Boards, *vice* Mr. T. R. Kennedy, Police Magistrate, resigned.

Mr. D. McLaurin, Temporary Inspector under the Diseases in Plants Acts, has been admitted to the Public Service and, together with Mr. S. A. Green, Clerk of the Department of Agriculture and Stock, has been appointed Inspector under the Diseases in Plants Acts, as from 1st November, 1928.

Mr. C. C. Parkinson, of Coorparoo, Brisbane, has been appointed Inspector on Probation, Agricultural Bank, as from 24th September, 1928.

Messrs. James Arthur Kerr, Foreman of the Stock Experiment Station, Townsville, Max Rose Muller, Temporary Inspector of Stock, Kingaroy, and Stanley Crawford Allan, late of Keeroongooloo, have been appointed Inspectors on probation under the Diseases in Stock Act. Messrs. Kerr and Allan will be in the Helidon Cleansing Area, and Mr. Muller in the Burnett district.

Messrs. W. H. Stobbs and K. R. Hack, of Nerang, have been appointed Honorary Inspectors under and for the purposes of the Diseases in Plants Acts.

**Queensland Butter Achieves Remarkable Distinction.**

Many dairy associations have been awarded prizes of merit at the dairy show recently held at Islington. The competitions were open to manufacturers of butters within the British Dominions, and there were seventy-five entries made in one class. The Co-operative Dairy Association, Gayndah, was successful in gaining the third place of merit in the Salted Butter Class, but it was in the Unsalted Butter Class that Queensland manufacturers achieved remarkable distinction. In this class the Oakley Dairy Association gained the first award. The Maryborough Co-operative Dairy Association was awarded third place, and the Downs Co-operative Dairy Association was very highly commended on the exhibits manufactured at Dalby, Goombungee, and Toowoomba factories. The results indicate that the manufacturers of butter in this State are continuing to maintain a high standard of quality and are sparing no effort to further improve that standard wherever it is possible to do so. The good reputation that is enjoyed by Queensland dairy produce on the overseas markets will be further enhanced as a result of the success that has been achieved at this important competition at the Dairy Show at Islington.

**Valedictory—Mr. C. W. Shenton.**

The officers of the Department of Agriculture and Stock assembled on Friday, 9th November, to bid farewell to a fellow-officer, Mr. C. W. Shenton, who has resigned from the public service after eleven and a-half years' service in the Department.

The Under Secretary of the Department, Mr. E. Graham, when presenting Mr. Shenton with a handsome eight-day clock on behalf of the officers, referred to his efficiency in carrying out the duties which had been entrusted to him, and to the popularity and esteem in which he was held by all members of the staff. He very much regretted that the Department was losing the services of such a promising officer, and wished him every success in his future career.

The Under Secretary's remarks were supported by Mr. S. S. Hooper, accountant, in whose branch Mr. Shenton had been employed during his term of office. Mr. Shenton suitably replied.

**Control of Banana Weevil Borer.**

The Minister for Agriculture and Stock (Mr. W. Forgan Smith) has drawn attention to the recent return from Java of an officer of the Entomological Branch of this Department. The officer in question (Mr. J. L. Froggatt) was sent to Java in May of this year primarily with the object of conducting an investigation into the question of the control of the banana weevil borer in that country. As it was believed that natural enemies played an important part in controlling this highly destructive insect, particular attention was devoted to that aspect of the investigation.

Mr. Forgan Smith said that as a result of Mr. Froggatt's work colonies of two enemies of the borer had been introduced to Queensland. One of these enemies was the maggot of a fly which is believed to be of material assistance in reducing borer infestation in the Dutch East Indies, and he was pleased to be in a position to state that a colony of this beneficial insect had already been liberated at Cooran. The other beneficial insect had not yet been liberated, and it is still being handled in quarantine in accordance with the precautions considered necessary in introducing such insects.

Emphasis was laid on the fact that although it was hoped that the introduced insects would eventually be of material assistance to the banana-grower in his fight against the borer, immediate relief could not be expected. Even if the natural enemies do become permanently established in the field, some considerable time must elapse before they have bred up in sufficient numbers to exercise an appreciable degree of control. In the meantime, therefore, Mr. Forgan Smith strongly recommends banana-growers to enthusiastically adopt the control measures recommended by the officers of his Department, and in particular to extensively use the poison baits for the destruction of the adult borer or beetle.

Mr. Froggatt also investigated other factors responsible for borer control in the Dutch East Indies.

The Minister further stated that a number of new varieties of bananas had also been brought back from Java, and these would be grown in strict quarantine for not less than two years. This precaution was being taken in order to eliminate, as far as is humanly possible, the danger of introducing further pests or diseases with the new varieties.

**Lucerne—Use the Cultivator.**

Lucerne sown in autumn should receive no cultivation until the following spring at earliest. The young plants are tender, and will not stand rough handling. On friable, loose soil, especially, the effect of cultivation would be to pull many of the plants out, and consequently the harrowing must be light, and should not be attempted until the roots have firm hold; but after the second cut, particularly on ground that sets hard, the harrow can be used.

The method of keeping early spring weeds in check is to mow frequently. The mower should be put over the crop before any of the weeds have commenced to flower, and the operation should be repeated a month or two afterwards. Two mowings will generally be sufficient. They must not be omitted if weeds are getting a foothold, even if the lucerne is not ready to cut, as the object is to destroy the weeds. If the quantity should warrant it, the cut material can be raked for green feed, but if left on the ground it makes a useful mulch.

Once lucerne becomes well established its vigorous growth keeps most weeds in check, but a certain amount of cultivation is necessary. A rigid-tine cultivator is the most suitable implement. The lucerne fields should be given a thorough stirring with this in July or August, and, if necessary, again later in the season. The loosening of the surface allows moisture to percolate to a greater depth, and prevents it from flowing away over the surface. Owing to the depth to which even light showers then penetrate, less loss occurs through evaporation.

If a rigid-tine cultivator is not available, a springtooth cultivator can be used very effectively if fitted with narrow tines specially designed for the cultivation of lucerne fields.

**Obituary.**

The untimely death of Mr. George Sutherland, B.Sc., A.A.C.I., on the 23rd October is generally regretted. Mr. Sutherland was engaged in the chemical laboratory of the Department of Agriculture and Stock for several years prior to his illness, and was formerly an officer of the Income Tax Office and of the Aborigines Department. He was well known at the Queensland University, where he achieved fame by his brilliant successes. During the war he enlisted and served his country on the fields of France and Egypt. It is generally felt that Queensland has lost a much-respected and highly-esteemed young scientist in the passing of Mr. Sutherland, and widespread sympathy is extended to his wife and family.

**Hints on Soldering.**

The materials necessary for soldering are one or two soldering irons, some sticks of solder, a bottle of muriatic acid (spirits of salts), and a small block of sal ammoniac. A handy container for the fire in which to heat the irons can be made out of an empty benzine tin or oil drum by cutting out the top, punching a few holes in the bottom, and cutting a hole in the side within an inch or so of the bottom, so that the heads of the irons can be passed through into the fire.

To prepare to solder, pour into a bowl (glass or ware—not tin or galvanised-iron) a quantity of the spirits and add a few pieces of zinc to "kill" the liquid. The soldering iron is first heated to a dull red heat, a fair portion of the point is filed clean, and this portion (while the iron is still hot) is rubbed with the sal ammoniac. The clean point is then tinned—that is, coated with solder—and this is of great importance if good work is to be performed later. To tin the iron, run a little solder on to a piece of clean tin, alternately turning its point in the melted solder and dipping it in the killed spirits.

Before using the soldering iron, clean the joint to be soldered, and with the aid of a brush put on a little of the killed spirits. The iron should be hot enough to make the solder run freely, but do not let it get red-hot. Withdraw it from the fire, brush the point with a piece of bagging, and dip it in the prepared spirits; then place the point of the iron on the joint to be soldered and move it slowly along, supplying solder as required by placing the end of the solder stick against the iron near the point. When soldering a loose patch, it will be found convenient to run a drop of solder on to the joint first, then hold the patch firm with the aid of the solder stick while the iron is operated to make the patch firm. The edges of any joints to be soldered should be fitted neatly and closely together, and the solder should run freely and adhere almost as if it were part of the tin.

### Arrowroot Board and Arrowroot Flour.

The Governor in Council has approved of the issue of a notice notifying his intention to place arrowroot flour under the control of the Arrowroot Board. Provision to permit of this was made in "*The Primary Producers' Organisation and Marketing Act Amendment Act of 1928.*"

Any petition for a poll to decide whether or not this Order shall be made must be signed by at least fifty growers or manufacturers of arrowroot, and must reach the Under Secretary, Department of Agriculture and Stock, Brisbane, before the 18th December, 1928.

For the purposes of the petition, an arrowroot grower is one who has supplied arrowroot bulbs grown by himself to any arrowroot mill in Queensland at any time during the past twenty-four months, and an arrowroot manufacturer is one who has manufactured arrowroot flour at any time within the past twelve months.

### Banana Suckers Affected with Bunchy Top.

Some little time ago a deputation of banana-growers waited upon the Minister for Agriculture and Stock (Mr. W. Forgan Smith) at Parliament House in connection with the matter of the eradication of banana suckers affected with Bunchy Top from the plantations owned by them at Camp Mountain.

During the discussion on this matter a suggestion was made to the effect that, provided the Minister would arrange that the inspectors under the Diseases in Plants Act would go through the plantations simultaneously with a working bee which would be constituted by the growers, the latter would forthwith carry out the destruction of any suckers infested with Bunchy Top. Some half dozen plantations were situated within the area over which it was intended the working bee should operate.

The Minister has since received a report from his officers advising that the work of eradication of Bunchy Top plants has been effected in six plantations comprising an aggregate area of about 105 acres. The working bee has been effective and has achieved its objective. From a Departmental point of view the results from the working bee are satisfactory. It is understood, however, that some of the growers found that on account of the fluctuation in the area under bananas on the individual farms there was difficulty in arranging the work on an equitable basis. The varying percentage of affected plants in the plantations added to this difficulty.

As far as is known, this is the first occasion on which a working bee has been constituted for the purpose of cleansing a group of plantations of different ownership of Bunchy Top.

### Graze Succulent Feed with Care—Conditions Conducive to Bloat.

Bloat, or hoven, is due to succulent foods eaten under certain conditions which cause the formation of large quantities of gas in the rumen or paunch, and in consequence a swelling of the left flank. It is most often seen (a) when cattle are turned hungry on to such succulent green food as lucerne, clover, &c.; (b) when cattle used to dry feed are suddenly changed on to green, soft food; (c) when travelling cattle are allowed access to large amounts of green food, such as variegated thistle; (d) when cattle gorge themselves on wet grasses or herbage; and (e) when cattle are fed on roots or potatoes under certain conditions. Some animals appear to be more subject to hoven than others.

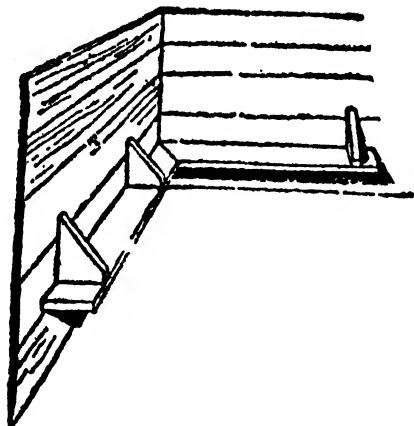
Keeping the mouth open with a gag, or a piece of wood, until the beast has belched most of the gas by mouth will be useful in mild cases. The internal administration of 1 oz. of bicarbonate of soda and 1 oz. of ginger is sometimes useful, and it may be repeated in a few hours if necessary. In a bad case the most effective treatment is the puncture of the paunch. This is done on the left side in the flank—at a point equidistant from the last rib, the edge of the loin bones, and the angle of the haunch. The correct instrument for this purpose is trocar and cannula.

The cannula is a tube through which passes a sharp-pointed instrument—the trocar. This instrument is thrust into the rumen, and the trocar is withdrawn, leaving the cannula in place, and through this the gas escapes. In case of emergency a knife may be used in the same way, the gas escaping through the cut; but complications may set in and cause death if this is not done expertly. After the gas has escaped the animal might be given a dose of linseed oil ( $1\frac{1}{2}$  pint) and turpentine (1 table-spoonful). This mixture should be well shaken up while being given.

Every effort should be made to prevent the occurrence of hoven in stock. In feeding lucerne and clover, if the animals are not used to it, they should be put on it gradually until they become accustomed to it. If lucerne is fed in a wet state, or after heavy rain—when it is soft and juicy—it will almost always produce trouble; and cattle should, therefore, be kept off it until it is drier.—"*A. and P. Notes,*" N.S.W. Ag. Dept.

### A PROTECTION RAIL FOR YOUNG PIGS.

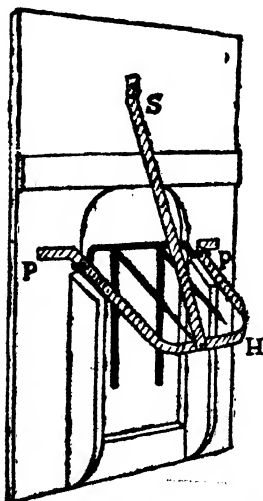
The simple device shown here is often the means of saving many lives. A 2 by 4 inch or a 2 by 6 inch piece of timber is placed about 8 inches above the floor of the farrowing pen, and nailed firmly to the side walls in the manner



illustrated. The sow's body may go against the side of the pen and strike the rail or fender, and if a little pig is there he has some chance of not being squeezed to death, because the rail keeps the weight off him.

### SAFEGUARD AGAINST FOXES.

An ingenious fox-excluder for outlying poultry houses in use in Lincolnshire, England, was illustrated in the "Farmer and Stockbreeder," from a sketch supplied by Mr. A. Tyler, country poultry lecturer for Lincolnshire. The two vertical iron rods in the entrance hole are attached to a crossbar which pivots at PP and



also carries a two-spiked rod in such a way as to allow the birds to enter without injury, but would preclude the entrance of anything the length of a fox. The crank in the pivoted bar serves to reduce the effort required to push the rods into a horizontal position. Danger to other stock is obviated by hoop-shaped guard, H, braced by the stay, S.

# The Home and the Garden.

## MATERNAL AND INFANT WELFARE.\*

While pondering on what aspect of the above subject—the most vital of all Australian problems to-day, as it seems to me—I happened in my evening paper on a glowing tribute to the British constitution under which it is our good fortune to live.

The speaker is Premier Taschereau, the French-Canadian leader in the province of Quebec. Sprung from a nation once the bitterest of our enemies and the formidable rival of England in the titanic struggle of a hundred years for mastery in the colonial world, that statesman, now proud to be a subject of the King, glories in eloquent words in the charter of our liberties.

“The British constitution,” says he, “wherever applied, is the most perfect governmental instrument that man has ever devised, making for liberty in its truest meaning, justice on its broadest lines, and peace under its most acceptable form.”

A special virtue of our constitution is that, though the best ever, it is still in the making; growing from age to age, to a higher level of completeness. And another essential fact is that, inspiring it all, and animating its evolution, is the soul of a people, with great traditions in the background of history, and, if it prove true to itself, with a glorious message of peace and goodwill for the future of the world.

### The Answer.

But, you may ask, what has this to do with the domestic function of motherhood and the nursing of babes? The answer is, it has everything to do with that. It is our duty and privilege to maintain this race in its purity, its lofty motives, its passion for freedom, its humanity. Many times has it drawn the sword to crush the oppressor and proclaim enfranchisement to them that were bound. For centuries the eyes of all nations have turned to it as the ensample and Paladin of Liberty.

### A Vital Factor.

And we should never forget that a sound motherhood is the most vital factor for the true prosperity of any people; while, conversely, no deeper injury can be dealt to the body politic of Australia than that we should so far fall from grace as, by any malign activity, or any defect of duty, to suffer injury to reach the mothers and children of the nation.

Unfortunately, great injury is now being incurred by death and disease among these, the most precious assets of the State and the family, considered from any standpoint—humane, moral, spiritual, economic. The family is the basis of our civilisation. On its wellbeing hangs the fate of Australia present and to come.

On these grounds I prize the opportunity of laying my views, formed not without some care and pains, before the country women of New South Wales through the organ of their association. There are two agencies in this State to which all women owe a debt of gratitude—the public Press and the statisticians.

For the last seven years, since I first wrote on maternal welfare in the journals, the Press generally has given liberal space to the discussion of this subject. “Country Life” has been specially generous.

Most politicians seem incapable of understanding; or, at all events, show no zealous interest; and the general public is indifferent or indolent, except when roused under the lead of a group of energetic women. But the pressmen at once grasped the meaning and national importance of the welfare of motherhood. A journalist is ready to listen; and, if he approves, will espouse a public cause and speak his views aloud.

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\* From “An Open Letter to Any Country Woman,” by A. Watson Munro, M.D., in “Country Life” (Sydney).

### Of the Statisticians.

Of the Government statisticians I can say, after considerable experience in Commonwealth and State, that I am deeply impressed with their impartiality and eagerness to get and give information.

They will not make statements except on the plain facts and figures. They form an invaluable factor in civilisation. One might say, in an important sense, that statistics are civilisation.

### Improving Visibility.

And here let me clear away, to begin with, some obscurity that exists in the minds of many women, regarding the accuracy of the statistics of maternal mortality.

Quite recently, a member of parliament, having read some of my letters in the Press, took great interest in the figures quoted. He asked some questions. One was: "May it not be that the mortality figures cover more than actual maternal mortality—that is, more deaths than are directly the result of childbirth?" Here is my reply.

### "The Answer is, Decidedly No."

Let me explain the meaning of a few terms. The term "childbirth" when used by statisticians and authorities on public health signifies the whole tale of gestation, starting from conception, on through pregnancy and parturition (delivery), right to the end of convalescence of the mother. And accordingly, by "mortality of childbirth" we mean the death of a mother at any point along that line of events.

If you consult official statistics, you will find a table of the various "causes of death" in childbirth. That list is based on the Bertillon system of classification, which is now used by the various European nations and Japan. By using it, we are able to make comparisons on a common basis, giving due allowance (as we always must, in human operations) for variation in some details of compilation; thus France, for example, differs from British countries in the definition of "stillbirth."

### Childbirth.

Remember (looking at the list of causes referred to) that women do not die simply of childbearing at the full term of pregnancy. What they die of is the complications thereof. Childbearing is a natural (physiological) act, analogous to the other vegetative functions of all living beings, such as swallowing or digestion or excretion.

But all these functions may be perverted by disease. Childbirth may become "pathological" or complicated; as by neglect of Nature's laws, of commonsense, of proper nourishment. Thus rickets, a dietetic disease of girlhood, and it may so deform the pelvis (the bony tunnel through which the infant travels) that in later life ordinary delivery is impossible.

Also, woman (like man) has "sought out many inventions." On the patient's part I mention unhealthy living, regimen, eating and drinking, dress; and (alas!) on the part of some obstetricians, male and female, a tendency to treat labour as if it were a disease, and resort to interference with its gradual and natural course.

### Troublesome Tinkering.

Such tinkering with the divinely planned mechanism for the perpetuation of the human race is practised mainly through ignorance, following on superficial study and defective practical training.

Ignorance will always peddle and fuss, where knowledge would "look before and after." Ignorance in action is an appalling spectacle. It has often led to disaster in human affairs. Warnings against this error, which seems to be on the increase in midwifery work, have lately been raised, again and again, by leading obstetricians here and in the homeland.

## KITCHEN GARDEN.

A first sowing of cabbages, cauliflower, and Brussels sprouts may now be made in covered seed beds, which must be well watered and carefully protected from insect pests. Sow in narrow shallow drills; they will thus grow more sturdy, and will be easier to transplant than if they were sown broadcast. The main points to be attended to in this early sowing are shading and watering. Give the beds a good soaking every evening. Mulching and a slight dressing of salt will be found of great benefit. Mulch may consist of stable litter, straw, grass, or dead leaves. Dig over all unoccupied land, and turn under all green refuse, as this forms a valuable manure. Turn over the heavy land, breaking the lumps roughly to improve the texture of the soil by exposure to the sun, wind, and rain. In favourable weather, sow French beans, cress, cauliflower, mustard, cabbage, celery, radish for autumn and winter use. Sow celery in shallow well-drained boxes or in small beds, which must be shaded till the plants are well up. Parsley may be sown in the same manner. Turnips, carrots, peas, and endive may also be sown, as well as a few cucumber and melon seeds for a late crop. The latter are, however, unlikely to succeed except in very favourable situations. Transplant any cabbages or cauliflowers which may be ready. We do not, however, advise such early planting of these vegetables, because the fly is most troublesome in February. For preference, we should defer sowing until March. Still, as "the early bird catches the worm," it is advisable to try and be first in the field with all vegetables, as prices then run high. Cucumbers, melons, and marrows will be in full bearing, and all fruit as it ripens should be gathered, whether wanted or not, as the productiveness of the vines is decreased by the ripe fruit being left on them. Gather herbs for drying; also garlic, onions, and eschalots as the tops die down.

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## FLOWER GARDEN.

To make the flower-beds gay and attractive during the autumn and winter months is not a matter of great difficulty. Prepare a few shallow boxes. Make a compost, a great part of which should consist of rotten leaves. Fill the boxes with the compost; then sow thinly the seeds of annuals. Keep the surface of the soil moist, and when the young seedlings are large enough to handle, lift them gently one by one with a knife or a zinc label—*never pull them up by hand*, as, by so doing, the tender rootlets are broken, and little soil will adhere to the roots. Then prick them out into beds or boxes of very light soil containing plenty of leaf mould. Keep a sharp lookout for slugs and caterpillars.

All kinds of shrubby plants may be propagated by cuttings. Thus, pelargoniums, crotons, coleus, and many kinds of tropical foliage plants can be obtained from cuttings made this month. After putting out cuttings in a propagating frame, shade them with a piece of calico stretched over it. Be careful not to over-water at this season. Propagate verbenas, not forgetting to include the large scarlet fox hunter. Verbenas require rich soil. Palms may be planted out this month. If the weather prove dry, shade all trees planted out. With seed-boxes, mulch, shade, water, and kerosene spray, all of which imply a certain amount of morning and evening work, the flower garden in autumn and winter will present a charming sight.

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Readers are reminded that a cross in the prescribed square on the first page of this "Journal" is an indication that their Subscription—one shilling—for the current year is now due. The "Journal" is free to farmers and the shilling is merely to cover the cost of postage for twelve months. If your copy is marked with a cross please renew your registration now. Fill in the order form on another page of this issue and mail it immediately, with postage stamps or postal note for one shilling, to the Under Secretary, Department of Agriculture and Stock, Brisbane.

## Orchard Notes for January.

### THE COASTAL DISTRICTS.

All orchards, plantations, and vineyards should be kept well cultivated and free from weed growth; in the first place, to conserve the moisture in the soil, so necessary for the proper development of all fruit trees and vines; and, secondly, to have any weed growth well in hand before the regular wet season commences. This advice is especially applicable to citrus orchards, which frequently suffer from lack of moisture at this period of the year if the weather is at all dry, and the young crop of fruit on the trees is injured to a greater or less extent in consequence.

Pineapple plantations must also be kept well worked and free from weeds, as when the harvesting of the main summer crop takes place later on, there is little time to devote to cultivation. If this important work has been neglected, not only does the actual crop of fruit on the plants suffer, but the plants themselves receive a setback.

Banana plantations should be kept well worked, and where the soil is likely to wash badly, or there is a deficiency of humus, a green crop for manuring may be planted. Should the normal wet season set in, it will then soon cover the ground without injury to the banana plants. When necessary, banana plantations should be manured now, using a complete manure rich in potash and nitrogen. Pineapples may also be manured, using a composition rich in potash and nitrogen, but containing no acid phosphate (superphosphate) and only a small percentage of bonemeal, ground phosphatic rock, or other material containing phosphoric acid in a slowly available form.

Bananas and pineapples may still be planted, though it is somewhat late for the former in the more southern parts of the State. Keep a good lookout for pests of all kinds, such as Maori on citrus trees, scale insects of all kinds, all leaf-eating insects, borers, and fungus pests generally, using the remedies recommended in Departmental publications.

Fruit fly should receive special attention, and on no account should infested fruit of any kind be allowed to lie about on the ground to become the means of breeding this serious pest. If this is neglected, when the main mango crop in the South and the early ripening citrus fruits are ready, there will be an army of flies waiting to destroy them.

Be very careful in handling and marketing of all kinds of fruit, as it soon spoils in hot weather, even when given the most careful treatment. Further, as during January there is generally more or less of a glut of fresh fruit, only the best will meet with a ready sale at a satisfactory price.

Grapes are in full season, and in order that they may be sold to advantage they must be very carefully handled, graded, and packed, as their value depends very much on the condition in which they reach the market and open up for sale. Well-coloured fruit, with the bloom on and without a blemish, always sells well, whereas badly coloured, immature, or bruised fruit is hard to quit.

One of the greatest mistakes in marketing grapes is to send the fruit to market before it is properly ripe, and there is no better way to spoil its sale than to try and force it on the general public when it is sour and unfit to eat.

Bananas for sending to the Southern States require to be cut on the green side, but not when they are so immature as to be only partially filled. The fruit must be well filled but show no sign of ripening; it must be carefully graded and packed and the cases marked in accordance with the regulations under the Fruit Cases Acts and forwarded to its destination with as little delay as possible.

Pineapples should be packed when they are fully developed, which means that they contain sufficient sugar to enable the fruit to mature properly. Immature fruit must not be marketed, and if an attempt is made to do so the fruit is liable to seizure and the sender of the fruit to prosecution under the abovenamed regulations. Further, the fruit must be graded to size and the number of fruit contained in a case must be marked thereon. Immature fruit must not be sent. For canning, the fruit should be partly coloured; immature fruit is useless; and overripe fruit

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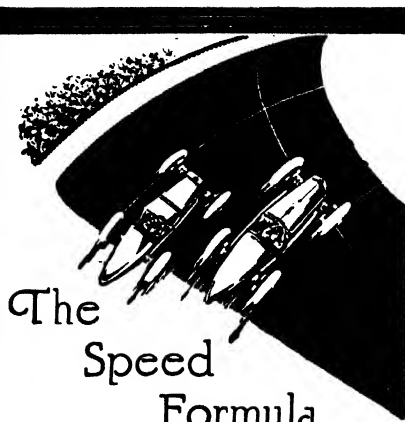
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is just as bad. The former is deficient in colour and flavour and the latter is "winey" and of poor texture, so that it will not stand the necessary preparation and cooking."

Should there be a glut of bananas, growers are advised to try and convert any thoroughly ripe fruit into banana figs.

The fruit must be thoroughly ripe, so that it will peel easily, and it should be laid in a single layer on wooden trays and placed in the sun to dry. If the weather is settled, there is little trouble, but if there is any sign of rain the trays must be stacked till the weather is again fine, and the top of the stack protected from the rain. To facilitate drying, the fruit may be cut in half lengthways. It should be dried till a small portion rubbed between the finger and thumb shows no sign of moisture. It can be placed in a suitable box to sweat for a few days, after which it can be dipped in boiling water to destroy any moth or insect eggs that may have been laid on it during the process of drying and sweating. It is then placed in the sun to dry off any moisture, and when quite dry it should be at once packed into boxes lined with clean white paper. It must be firmly packed, when, if it has been properly dried, it will keep a considerable time. It can be used in many ways, and forms an excellent substitute for raisins, sultanas, currants, or other dried fruits used in making fruit cakes and other comestibles. Banana figs will be found useful for home consumption, and it is possible that a trade may be built up that will absorb a quantity of fruit that would otherwise go to waste.

### THE GRANITE BELT, SOUTHERN AND CENTRAL TABLELANDS.

January is a busy month in the Granite Belt, and orchardists are fully occupied gathering, packing, and marketing the crop of midseason fruits, consisting of plums of several kinds, peaches, nectarines, pears, and apples. The majority of these fruits are better keepers and carriers than those that ripen earlier in the season; at the same time, the period of usefulness of any particular fruit is very limited, and it must be marketed and disposed of with as little delay as possible.

With the great increase in production, owing to the large area of new orchards coming into bearing and the increasing yields of those orchards that have not come into full profit, there is not likely to be any market for immature or inferior fruit. There will be ample good fruit to fully supply the markets that are available and accessible. Much of the fruit will not carry far beyond the metropolitan market, but firm-fleshed plums, clingstone peaches, and good firm apples should stand the journey to the Central, and, if they are very carefully selected, handled in a manner to prevent any bruising, and properly graded and packed, they should carry as far as Townsville. Growers must remember that, given a market fully supplied with fruit, only such fruit as reaches that market in first-class condition is likely to bring a price that will pay them; consequently the grower who takes the trouble to send nothing but perfect fruit, to grade it for size and colour, to pack it carefully and honestly, placing only one sized fruit, of even quality and even colour, in a case and packing it so that it will carry without bruising, and, when opened up for sale, will show off to the best advantage, is pretty certain of making good. On the other hand, the careless grower who sends inferior, badly graded, or badly packed fruit is very likely to find when the returns for the sale of his fruit are to hand, that after paying expenses there is little, if anything, left. The expense of marketing the fruit is practically the same in both cases.

Then "why spoil the ship for the ha'p'orth of tar" after you have gone to the expense of pruning, spraying, manuring, and cultivating your orchard? Why not try and get a maximum return for your labour by marketing your fruit properly? The packing of all kinds of fruit is a fairly simple matter, provided you will remember—

- (1) That the fruit must be fully developed, but yet quite firm when gathered.
- (2) That it must be handled like eggs, as a bruised fruit is a spoilt fruit, and, when packed with sound fruit, spoils them also.
- (3) That only one-sized fruit, of an even degree of ripeness and colour, must be packed in a case.
- (4) That the fruit must be so packed that it will not shift, for if it is loosely packed it will be so bruised when it reaches its destination that it will be of little value. At the same time, it must not be packed so tightly as to crush the fruit.

If these simple rules are borne in mind, growers will find that much of the blame they frequently attribute to the fruit merchants or middlemen is actually the result of their own lack of care. Fruit that opens up in the pink of condition sells itself, whereas any fruit that opens up indifferently is hard to sell on any except a bare market, and on a glutted market is either unsaleable or realises such a poor price that the grower is frequently out of pocket and would have been better off had he not attempted to market it.

If spraying with arsenate of lead, and systematic bandaging, has been properly carried out, there will be comparatively few codlin moths to destroy the later ripening pip fruits; but if these essential operations have been neglected or carelessly carried out a number of moths will hatch out and the eggs laid by them will turn to larvae that will do much damage, in some cases even more than that caused by the first broods that attack the fruit as soon as it is formed. Where there is any likelihood, therefore, of a late crop of moths, spraying with arsenate of lead must be continued if the late crop of pip fruits is to be kept free from this serious pest.

Fruit fly must be systematically fought, and on no account must any fly-infected fruit be allowed to lie about on the ground and breed this pest, to do further damage to the later ripening fruits.

Citrus orchards will need to be kept well cultivated in the drier and warmer parts of the State, and, where necessary, the trees should be irrigated. If scale insects are present, the trees should be either sprayed, or, better still, treated with hydrocyanic acid gas.

Western grapes are in full season, and if they are to be sent long distances by rail then they are all the better to be cut some hours before they are packed, as this tends to wilt the stems and keep the berries from falling off in transit. The fruit must be perfectly dry when packed, and should be as cool as possible. It must be firmly packed, as a slack-packed case always carries badly and the fruit opens up in a more or less bruised condition.

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## Farm Notes for January.

**FIELD.**—The main business of the field during this month will be ploughing and preparing the land for the potato and other future crops, and keeping all growing crops clean. Great care must be exercised in the selection of seed potatoes to ensure their not being affected by the Irish blight. Never allow weeds to seed. This may be unavoidable in the event of long-continued heavy rains, but every effort should be made to prevent the weeds coming to maturity. A little maize may still be sown for a late crop. Sow sorghum, imphee, Cape barley, vetches, panicum, teosinte, rye, and cowpeas. In some very early localities potatoes may be sown, but there is considerable risk in sowing during this month, and it may be looked upon merely as an experiment. Plant potatoes whole. Early-sown cotton will be in bloom.

On coastal and intercoastal scrub districts, where recently burnt-off scrub lands are ready for the reception of seed of summer-growing grasses, sowing may commence as soon as suitable weather is experienced. Much disappointment may be saved, and subsequent expenditure obviated, by ensuring that only good germinable grass seed is sown, of kinds and in quantities to suit local conditions, the circumstances being kept in mind that a good stand of grass is the principal factor in keeping down weeds and undergrowth.

In all districts where wheat, barley, oats, canary seed, and similar crops have recently been harvested, the practice of breaking up the surface soil on the cropped areas should invariably be adopted. Soil put into fit condition in this way will "trap" moisture and admit of the rains percolating into the subsoil, where the moisture necessary for the production of a succeeding crop can be held, provided attention is given to the maintenance of a surface mulch, and to the removal, by regular cultivation, of volunteer growths of all kinds. If not already seen to, all harvesting machinery should be put under cover, overhauled, and the woodwork painted where required.

Where maize and all summer-growing "hoed" crops are not too far advanced for the purpose, they should be kept in a well-cultivated condition with the horse hoe. Young maize and sorghum crops will derive much benefit by harrowing them, in the

same direction as the rows are running, using light lever harrows with the tines set back at an angle to obviate dragging out of plants, but the work should not be done in the heat of the day.

Quick-maturing varieties of maize and sorghum may still be sown in the early part of the month in coastal areas where early frosts are not expected.

Succession sowings may be made of a number of quick-growing summer fodder crops—Sudan grass, Japanese and French millet, white panicum, and liberty millet (panicum). In favourable situations, both “grain” and “saccharine” sorghums may still be sown; also maize, for fodder purposes.

Fodder conservation should be the aim of everyone who derives a living from stock, particularly the dairyman; the present is an important period to plan cropping arrangements. Exclusive of the main crops for feeding-off (when fodder is suitable for this purpose), ample provision should be made for ensilage crops to be conserved in silo or stack. As natural and summer-growing artificial grasses may be expected to lose some of their succulence in autumn, and more of it in winter and early spring, the cropping “lay-out” to provide a continuity of succulent green fodder throughout the season calls for thorough and deep cultivation and the building up of the fertility and moisture-holding capacity of the soil. Planter’s friend (sorghum) may be sown as a broadcast crop at the latter end of the month for cutting and feeding to cattle in the autumn and early winter. Strips of land should be prepared also for a succession sowing about the second week in February, and for winter-growing fodder crops.

### THE STORY OF PNEUMATIC TYRES.

It is exactly forty years ago since John Boyd Dunlop applied for the patent for the first pneumatic tyre. He had just retired from his veterinary practice in Belfast, the largest one in Ireland, where twelve horse-shoers worked for him.

While a boy at school in the village of Dreghorn, Ayrshire, his native place, Dunlop observed that a large wooden roller was easier to pull than a smaller one, because, as it had a larger area of surface bearing on the ground, the pressure on each unit of area was less.

For years he thought on the idea of wheels with flexible rims that would flatten out and so increase the area of contact with the road. It was a complaint from his small son Johnny, then nine years of age, which actually materialised in the first rubber tyres to be filled with air. Johnny had grumbled about the difficulty of riding on thin solid tyres over the uneven stone setts of Belfast’s streets.

His father thereupon made two air tubes from sheet rubber one thirty-second of an inch thick, fixed them to a wooden disc with a thin strip of linen, and blew them up with a football pump. The tyres were then fitted to a tricycle made by Dunlop from American elm to his own design with specially shaped rims. The whole was completed one night at ten o’clock, and so eager were both father and son to test the new device that the boy went out for a run in the moonlight and returned triumphant at midnight.

When a racing cyclist who was shown the novelty expressed his doubts about it, the inventor challenged him to a race on his thin solid tyres against the nine-year-old boy on the home-made tricycle equipped with pneumatics. It was the first of the unending tale of races to be won on Dunlops. Although John Boyd Dunlop revolutionised cycling, and made motor cars possible, he himself could not at that time ride a bicycle; indeed, there is no record that he ever rode one all his life.

#### A VALUABLE REFERENCE JOURNAL.

*A Theodore settler writes—“I would be glad to have whatever back numbers of the “Queensland Agricultural Journal” you can spare, for I consider them very valuable for reference, no matter how old they are.”*

**ASTRONOMICAL DATA FOR QUEENSLAND.**

TIMES COMPUTED BY D. EGLINTON, F.R.A.S., AND A. C. EGLINTON.

**TIMES OF SUNRISE, SUNSET, AND MOONRISE.**

AT WARWICK.

				MOONRISE.	
		December, 1928.		January, 1929.	
		Rises.	Sets.	Rises.	Sets.
				Rises.	Rises.
Date.					
1	4.50	6.32	5.1	6.49	p.m. 30.44
2	4.50	6.32	5.2	6.49	p.m. 11.10
3	4.50	6.33	5.3	6.49	p.m. 11.43
4	4.50	6.34	5.3	6.50	a.m. 12.8
5	4.50	6.35	5.4	6.50	a.m. 12.43
6	4.50	6.35	5.5	6.50	1.12
7	4.50	6.36	5.6	6.51	1.42
8	4.50	6.36	5.6	6.51	2.12
9	4.50	6.37	5.7	6.51	2.41
10	4.51	6.38	5.8	6.51	3.15
11	4.51	6.39	5.9	6.51	3.48
12	4.51	6.40	5.9	6.51	4.28
13	4.51	6.40	5.10	6.51	5.14
14	4.52	6.41	5.11	6.51	6.3
15	4.52	6.41	5.12	6.51	6.56
16	4.52	6.42	5.13	6.51	7.50
17	4.52	6.43	5.13	6.51	8.46
18	4.53	6.43	5.14	6.51	9.46
19	4.53	6.44	5.15	6.51	p.m. 10.43
20	4.54	6.44	5.16	6.50	p.m. 11.49
21	4.54	6.45	5.16	6.50	p.m. 12.40
22	4.55	6.46	5.17	6.50	1.42
23	4.55	6.46	5.18	6.49	2.47
24	4.56	6.47	5.19	6.49	3.55
25	4.56	6.47	5.19	6.49	5.8
26	4.57	6.47	5.20	6.48	6.17
27	4.57	6.48	5.21	6.48	7.24
28	4.58	6.48	5.22	6.48	8.26
29	4.59	6.48	5.23	6.47	9.19
30	5.0	6.49	5.24	6.47	10.2
31	5.0	6.49	5.25	6.47	10.43

**Phases of the Moon, Occultations, &c.**

The times stated are for Queensland, New South Wales, Victoria, and Tasmania.

4 Dec.	☾ Last Quarter	12 31 p.m.
12 "	● New Moon	3 6 p.m.
20 "	☾ First Quarter	1 43 p.m.
27 "	○ Full Moon	5 54 a.m.

Apogee, 11th December, at 7 18 p.m.

Perigee, 26th December, at 12 30 p.m.

The Moon when making a complete revolution about the earth in December will, apparently, be among the stars of Cancer on the 1st and 2nd, of Leo on the 3rd and 4th, of Virgo from the 5th to the 8th, of Libra from the 8th to the 10th, of Scorpio on the 10th and 11th, of Orpheus on the 12th and 13th, of Sagittarius from the 14th, to 16th, of Capricornus on the 17th and 18th, of Aquarius on the 19th, of Pisces on the 20th, of Cetus on the 20th and 21st, of Pisces on the 21st, of Aries on the 23rd and 24th, of Taurus from the 24th to 26th, of Gemini on the 27th and 28th, of Cancer on the 28th and 29th, and of Leo on the 30th and 31st.

When apparently in Leo on the 3rd and again on the 30th the Moon will pass within 5 degrees of Neptune, which is still near Regulus, but invisible without a telescope.

Saturn and Mercury will be passed on the 12th when the Moon is new and invisible.

On the 16th, when passing Venus about 9 a.m., an interesting daylight spectacle may be obtained, the crescent Moon and the beautiful planet being in the east-south-east.

On the 26th the Moon will occult Mars about the time of rising; and a small star in Taurus about an hour or so later.

Mercury will be on the far side of its orbit almost directly behind the Sun on the 18th, and only one degree above its upper edge at noon; it will therefore not be noticeable this month.

Venus will set at 9.23 p.m. on the 1st and at 9.35 p.m. on the 15th.

Mars will rise at 8.36 p.m. and set at 6.18 p.m. on the 1st. On the 15th it will rise at 7.20 p.m. and set at 5.29 a.m.

Jupiter will rise at 3.34 p.m. and set at 2.48 a.m. on the 1st. On the 15th it will rise at 2.33 p.m. and set at 1.53 a.m.

Saturn will rise at 5.58 a.m. and set at 8.30 p.m. on the 1st; it will be in conjunction with the Sun on the 13th and therefore rise and set with it.

3 Jan.	☾ Last Quarter	4 34 a.m.
11 "	● New Moon	10 28 a.m.
19 "	☾ First Quarter	1 15 a.m.
25 "	○ Full Moon	5 9 p.m.

Apogee, 8th January, at 1.42 a.m.

Perigee, 23rd January, at 9.48 p.m.

For places west of Warwick and nearly in the same latitude, 28 degrees 12 minutes S., add 4 minutes for each degree of longitude. For example, at Inglewood, add 4 minutes to the times given above for Warwick; at Goondiwindi, add 8 minutes; at St. George, 14 minutes; at Cunnamulla, 25 minutes; at Thargomindah, 33 minutes; and at Oontoo, 43 minutes.

The moonlight nights for each month can best be ascertained by noticing the dates when the moon will be in the first quarter and when full. In the latter case the moon will rise somewhat about the time the sun sets, and the moonlight then extends all through the night; when at the first quarter the moon rises somewhere about six hours before the sun sets, and it is moonlight only till about midnight. After full moon it will be later each evening before it rises, and when in the last quarter it will not generally rise till after midnight.

It must be remembered that the times referred to are only roughly approximate, as the relative positions of the sun and moon vary considerably.

[All the particulars on this page were computed for this Journal, and should not be reproduced without acknowledgment.]

